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READERS PLEASE NOTE

As announced in the September, 1937, issue of this magazine, there will be no July and August issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

The September, 1938, issue will be ready for mailing on the 15th of August. Readers who contemplate changing their positions for the coming school year are urged to furnish their new addresses as soon as possible, so that the September number of our magazine may be promptly mailed to them.

VACATION TIME

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION wishes all shop teachers a very enjoyable and satisfying vacation.

No matter how a teacher spends his vacation, he has but one objective in view, and that is to prepare himself so that the new school year, will find him better prepared to take care of his work in the classroom.

To those who have not as yet read "Last-Minute Observations" on page 241 of this issue, it is recommended that they do so now. It is just possible that the checking list given in that editorial may contain a suggestion that is particularly timely.

Until September, then — good luck!

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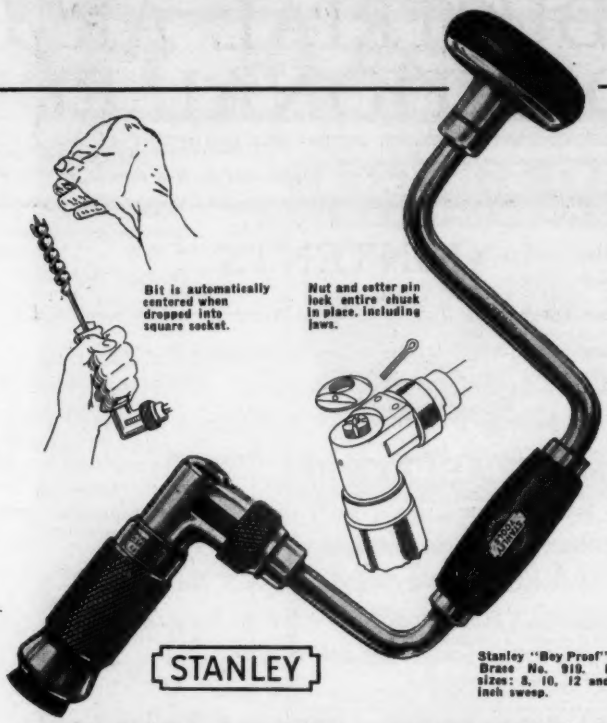
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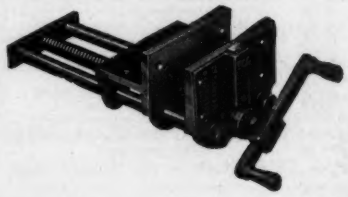

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June, 1938
Vol. 27, No. 6

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Occupational Training and Employment

Heber A. Sotzin

State College,
San Jose, California

"Educated people must labor; otherwise, education becomes a positive and an intolerable evil. No nation can sustain in idleness but a small percentage of its numbers [people]. The majority must work at something productive, and from this premise the problem springs: How can education and labor be more satisfactorily combined."—*Abraham Lincoln.*

The term "occupational training" connotes specific training for a recognized vocation in which an individual may be gainfully employed. All of our so-called "practical courses" grew out of early apprenticeship training and date back to about 2250 B.C.

Early apprenticeship training was characterized by the existence of a filial relationship between the apprentice and the master. In addition to being taught the secrets of an occupation, the apprentice was taught the three R's, provided with food, clothing, and shelter, and given religious and moral instruction. This type of training fused manipulative skill, certain educational elements, and discipline into a sound occupational and social relationship.

Among the ancient Jews, labor was a religious duty. While the chief aim of ancient Jewish education was religious, training for a trade or some other occupation was considered next in importance to instruction in the Law. A few excerpts from the Talmud indicate their vocational philosophy:[1]

"Great is the dignity of labor; it honors man."

"Beautiful is the intellectual occupation if combined with some practical work."

"He who derives his livelihood from the labor of his hands is as great as he who fears God."

"He who lives on the toil of his hands is greater than he who indulges in idle piety."

While these statements are of ancient origin, and probably obsolete, due to the perfection of the machine and large-scale production, they contain, however, basic concepts which are of value in modern times. They emphasize social values which accrue by combining manual skill and intellectual training.

During the Middle Ages and through the development of the system of trade guilds, apprenticeship was the only educational agency available for the middle-class youth of England and Europe. From the twelfth to the middle of the fifteenth century, apprenticeship was seven years in length and could not be terminated before the age of twenty-four, and only those who had fully completed their apprenticeship could be admitted into employment as craftsmen. The guilds' strength and influence grew until they became so autocratic and menacing that they were finally outlawed by Queen Elizabeth.

Learning by Doing

With the rise of the Italian Renaissance and the quest for a more practical type of education, a more functional type of education was demanded than that based upon Greek and Latin. During the sixteenth and seventeenth centuries, there was much agitation and criticism relative to abstract subject-matter content. It was not until the eighteenth and nineteenth centuries that education became more practical. Leaders such as Pestalozzi and Fellenburg were pioneers in the movement. Pestalozzi is often referred to as the "Father of Manual Training." It was he who based his educational philosophy upon "sense impressions," advocated "learning by doing," and was the first to psychologize education. His colleague, Fellenburg, was the "Father of Vocational Education." He attempted to regenerate society by educating together the three social groups of society—peasant, middle class, and royalty. The first and second groups received agricultural and mechanical training, while the latter received classical training. The value of vocational training in his school was reflected in the economic and social improvement of Switzerland. Many Americans, including Horace Mann, visited Fellenburg's school and pronounced it the best school ever established anywhere in the world.

The need for educational service and the type of service rendered must be considered, so well as the need for governmental economy.

American colonial apprenticeship, manual training, trade- and technical-school training were foreign importations. At first, they were patterned after the English and European systems, but, later, were modified to meet American needs.

With the rise of industry in this country, due to the wealth of our natural resources and American inventive genius, the old type of apprenticeship broke down and almost disappeared. A small group of American educators, some socially minded industrialists and other interested individuals, agitated for years in the Federal Congress for a system of trade education of less than college grade. A committee was appointed by Congress in 1915 to make an investigation and report its findings. After a two-year study, the committee reported that our national welfare was at stake; that less than 1 per cent of those gainfully employed were adequately trained for their jobs, or had an opportunity to receive training to improve their knowledge and abilities for the work in which they were engaged. Evidence was presented to show the superiority of the European system of trade education, which had developed better and more skilled workers. The claim was made that the lack of an occupational-training program in this country was resulting in inferior American industrial products and loss of world markets. The result was the passage of the Smith-Hughes Federal Vocational Act

[1] Bennett, C. A., *History of Manual and Industrial Education up to 1870*, Chap. I, p. 14. Manual Arts Press.

in 1917. The primary purpose of the act was to promote and stimulate vocational education of less than college grade throughout the states of the nation, in the fields of agriculture, trade and industrial education, and home economics. The act provided a federal subsidy of $500,000 for the first year, with annual increases until a maximum of $3,000,000 was reached in 1926, and the establishment of six types of trade or industrial schools or classes: (1) Evening industrial, (2) part-time trade extension, (3) part-time trade preparatory, (4) part-time general continuation, (5) all-day unit trade, and (6) general industrial, for cities under 25,000. The minimum age limit was set at fourteen.

The original act has been supplemented by the George-Reed Act (1929–1934), the George-Ellzey Act (1935–1937), and the George-Deen Act (1937). Each of these acts has increased the federal subsidy. The George-Deen Act has added more than $14,000,000, making a total federal appropriation in excess of $21,000,000.

The Advisory Committee on Education

Before the appropriation bill was passed for the George-Deen Act, President Roosevelt appointed a committee which[2]

"should study the experience under the existing program of federal aid for vocational education, the relation of such training to general education and to prevailing economic and social conditions, and the extent of the need for an expanded program."

The committe presented an adverse report for increasing federal aid for vocational education, by saying:[3]

"The Committee is unanimous in the recommendation that financial support by the Federal Government for the types of vocational education now receiving support should be continued without curtailment during the coming fiscal year. We are not in favor of the enlargement of Federal support at this time.

"We are impressed by the number and importance of the requests now before Congress for Federal support of education. We, therefore, believe that it would be undesirable to add to the funds now contributed by the Federal Government for the support of vocational education until consideration has been given to the whole subject of Federal relations to State and local conduct of education of all types.

"Our feeling that there should be no expansion of the funds provided for vocational education until after there has been a thorough replanning of Federal relations to all education is re-enforced by the studies we have already made of the vocational education statutes and administration.

"The basic vocational education statute, the Smith-Hughes Act, has not been revised since its enactment 20 years ago. Even as supplemented by additional legislation, it does not provide the basis under present conditions for a sound program of Federal aid to vocational education. The several vocational statutes are a patchwork of complex and obscure provisions, many of which are inconsistent with present conditions and needs.

"The basis for the distribution of funds among the States, as provided in the vocational education statutes, tends in many cases to increase rather than to decrease inequalities in educational opportunity. Inequalities arise from the operation of the State minimum allotments and from the matching provisions. They arise also from the difficulties encountered in attempts to administer a vocational program in small rural high schools. The areas most in need of aid are the ones least able to meet the matching and other qualifying provisions.

"We believe that the training of the personnel necessary for extension and improvement of vocational education is a problem of the first importance and one that should receive early attention. Readjustments to make possible an expansion and improvement in the training of teachers could be made under current appropriations. At present, however, the teacher personnel is not available in most of the States to staff enlarged programs of vocational education unless certification standards are materially reduced and teachers are employed who are not well qualified.

"We desire to record our belief that excellent programs of vocational education exist in certain of the States and in numerous localities. On the other hand, progress in some other areas has been much less satisfactory, and this relative lack of progress has not been due primarily to limitation upon the amount of funds available. Research in this field has been concerned very largely with relatively minor problems. Much less attention has been given to the basic studies that would assist in the determination of fundamental issues. The administration of Federal aid has been unsatisfactory in many ways, and frequently has tended to be arbitrary and unco-operative. We are impressed by the relative lack of able, co-operative, and far-sighted leadership in certain phases of the vocational education program.

"We would also call attention to the fact that the vocational education program under the Smith-Hughes and related statutes is not the only program through which the Federal Government is now providing assistance in meeting the needs for vocational training. Such training has become increasingly important among the purposes of the Civilian Conservation Corps. It is also receiving attention in the educational programs of the Works Progress Administration and the National Youth Administration. We plan to give further consideration to the experience of these emergency and new programs, and to the needs in the newer fields of vocational education such as the distributive and the public service occupations."

President Roosevelt signed the appropriation bill for the George-Deen Act, "with much reluctance," on August 9, 1937. In his characteristic and forceful manner he voiced his opposition by saying:

"I have, with much reluctance, affixed my signature to H.R. 6958, the Appropriation Bill for the Department of the Interior for the fiscal year 1938. The principal item of difficulty was the appropriation of nearly fourteen and a half million dollars for the further development of vocational education — ten million dollars more than the estimate of the Bureau of the Budget which I presented to Congress.

"I recognize that a sound program of vocational education is greatly needed in the United States, but an appropriation at this time of the full amount authorized under the Act of June 8, 1936, known as the George-Deen Act, is not the way to meet this need.

. . . . . .

"Much of the apparent demand for the immediate extension of the vocational education program under the George-Deen Act appears to have been stimulated by an active lobby of vocational teachers, supervisors, and administrative officers in the field of vocational education, who are interested in the emoluments paid in part from Federal funds. It is not without significance that in the course of the debates on this appropriation, members of both houses of the Congress referred to the pressure exerted upon them by groups actively lobbying in behalf of the full appropriation.[4] Evidence was read into the records of the debates in both houses indicating that much of the impetus behind this movement emanated from a single, interested source.

. . . . . .

" . . . it is clear that I would be subject to censure if any of the $14,483,000 appropriated in this Act for vocational training were spent inefficiently or inadvisedly. The Congress having appropriated the money to the extent of $10,000,000 more than was recommended, I will, therefore, carry out what is obviously the intention of the Congress — that as much of the total sum shall be expended during the current fiscal year as can properly and usefully be spent — no more and no less."

Analyzing the Adverse Criticisms of the George-Deen Act

In analyzing the criticisms directed toward this act, (George-Deen), and without holding a brief for them, several items are significant. *First:* The President's Educational Advisory Council does not contain a vocational educator. If it did, it is probable that the list of criticisms would have been increased, as the history of the world shows the severest critics of

[2]Report, The Advisory Committee on Education, Washington, D. C., April 24, 1937, p. 1.
[3]*Ibid.*, pp. 4–6.

[4]*Congressional Record*, Vol. 81, No. 121, Monday, June 28, 1937, pp. 8311–8317.

any social agency to be those who have been trained or who have been engaged in the particular type of work under scrutiny. Competent and progressive vocational educators are cognizant of many defects within their particular specialty. Vocational education of less than college grade, on a public and national basis, is only twenty years old. Consequently, this type of education is very new. It has been a period of pioneering, establishment, and experimentation, and the ills which accompany any pioneer movement have not escaped vocational education.

Second: Reference is made to the work of "an active lobby" for increasing the appropriation for vocational education. This statement cannot be denied. Unfortunately, we are living in an age when "pressure groups" predominate in legislative halls. Frequently, bills are not decided upon a basis of merit but upon the amount of pressure that is placed upon legislators. Furthermore, when groups of teachers or the officers of their professional association employ, in their legislative dealings, the tactics of "big business," a hue and cry of unprofessional and unethical conduct is raised immediately.

Third: When the hue and cry of *economy* is raised, whether valid or false, the exhorter can usually gain an audience or hearing; but when the expression *service* is used or implied, in the interest of human welfare or betterment, generally very little enthusiasm is aroused. Appropriations for any type of education should be made on the basis of pupil need and welfare. It is significant to note that seldom has reference been made, in the agitation relative to the George-Deen appropriation bill, to the fact that in excess of one million boys and girls, men, and women have been receiving direct occupational-training benefits under the federal subsidy, while many others have been indirectly benefited. The plea of governmental economy always reaches more people than a plea for governmental services.

With the development of modern science and its application to invention and industry, great and sudden technological changes have occurred. The capitalistic system works well when the manufacturer can sell his product at a profit, reinvest the profits and expand his organization. When a machine is perfected, such as the modern ditch digger, glass-bottle blower, electric-light-bulb machine, cotton picker, etc., hundreds and thousands of employees are thrown out of work, who cannot be absorbed or find employment elsewhere, and their lack of income prevents them from purchasing the product produced by the machine, although it may be a better product, at a lower cost than formerly. The inevitable result is glutted warehouses and economic chaos. The situation is not one of overproduction but underconsumption caused by lack of income. A Brookings Economic Institute Report by Dr. Moulton,[5] the director, shows that at the height of our economic peak in 1929, only 80 per cent of American manufacturing-plant capacity was utilized. Furthermore, the income of 70 per cent of the population, or twenty million families, was under $1,500. The majority of this group can save little and afford few luxuries. The report states, also, that if a "reasonable standard of living" were maintained — a standard determined by the United States Department of Agriculture (prior to the New Deal) — industry would not be suffering from plant excess but would require a 75-per-cent increase.

Youth and the Present Age

This brings us to the crux of our topic — the training and employment of youth. At present, the term "youth" is considered to be an age range from 16 to 24 years. The most obvious situation today is the fact there are more people than jobs. Jobs are no longer paging youth — youth is paging jobs, despite the fact that the 1930 census shows 557 major occupational divisions with 25,000 separate jobs listed — an increase of 5,000 above the 1920 census. Educational authorities estimate that of the twenty million young people between the ages of 16 and 24, five million — one out of four — are without a constructive occupation at school, at work, or at home. Young people, unlike canned goods or imperishable products, cannot be filed or stored away for future use. Investigations by the authorities on vocational education, in the Federal Office of Education, disclose as the chief reasons for lack of employment:

1. The increased age of entrance into industry.
2. The increased mechanization of industry.
3. The progressive elimination of unskilled labor.
4. Higher standards of personnel selection.
5. Shorter hours of work.
6. Greater output per man-hour.
7. The development of new processes, materials, and products.
8. Longer work expectancy on the part of the worker.
9. The obsolescence of long established occupations and the development of new ones.
10. The elimination of child labor.
11. The stultification of craftsmanship aptitude and ability.
12. Progressive industrial specialization.

The public school is the largest single social agency in this country, the only agency to reach everyone. What can it do in the present dilemma?

The junior high school became a part of the secondary-school system "to fill the gap between the eight-year elementary school and the four-year high school." Has it fulfilled this promise? The preponderance of evidence appears to be on the negative side. The junior-high-school pupil was supposed to "adjust himself" in the 7th grade, "explore" in the 8th grade, "select" and "find himself" in the 9th grade. Assuming that he did "select" and "find himself" in the 9th grade, then only two types of curriculums were necessary in the senior high school — college preparatory and vocational — as pupils upon leaving high school would either attend a higher institution of learning or enter employment. Those who reasoned in this manner have been obliged to change their viewpoints within the past half dozen years, as the majority of pupils graduating from the senior high school cannot find employment.

Consequently, a change of emphasis is needed. If the junior high school is to be a period of exploration, tryout, and finding, let provision be made for an insight and experience in the major fields of human endeavor. These may be characterized, roughly, under ten major headings, divisions, or classifications: (1) Wood, (2) metal, (3) electricity, (4) graphic arts, (5) ceramic arts, (6) textile arts, (7) agricultural arts, (8) transportation and communication, (9) commerce, (10) household arts.

Example:

Transportation and communication

- Auto mechanics
- Diesel engine
- Aviation
- Radio
- Agricultural machinery
- Gas engines, tractors
- Pumps and irrigation
- Telephony, telegraphy, etc.

For those senior-high-school pupils who do not care for or cannot do abstract work successfully, a program can be built around one or two of these major fields. As pupils advance to the junior college — and this is a definite trend, at least in California — opportunities should be provided for a two-year vocational course for those who plan to enter remunerative employment at the completion of the junior college. If a student has been inter-

[5] Moulton, H. G., "The Trouble with Capitalism is the Capitalist," *Fortune Magazine*, Vol. XII, No. 5, November, 1935, pp. 77–81.

ested in the field of transportation and communication in the junior and senior high school, he might select radio or aviation for his pre-employment training program in the junior college. Present trends indicate that the junior college will become the vocational school of the future for many skilled occupations on the craftsman level and for many semiprofessional occupations. In the past two decades semiprofessional occupations have increased in excess of 500 per cent.

Furthermore, the time is rapidly approaching when all workers will be occupationally trained and certified relative to their training and degree of occupational competency. The certification of the physician, dentist, lawyer, and aviation mechanic may be used as precedents. This prediction is based upon the rapidly rising personnel standards in industry, the demands for a higher degree of manipulative skill, and the increasingly complex technical information which skilled workers must master. Additional reasons are the increasing specialties and graduations of job levels within occupations. Printing, for instance, is an example of an industry involving many work jobs, ranging in complexity from that of feeding a small press, to the most advanced phases of art and design, and complicated mechanical skills.

The optimist states with pride that heretofore a solution has always been found to remedy our employment ills. He cites the agricultural expansion, the railroads, the automobile, the motion picture, etc. If anyone sees a major industry on the distant horizon today, which can absorb millions of unemployed and provide jobs for oncoming youth, it is being cleverly concealed.

There are many who fulminate at the various governmental work projects under the New Deal and the notorious "sit-down strikes," and point to them as evidence that numerous individuals have no desire to work, but expect a paternalistic government or employer to provide for them. Are these criticisms just? Does factual evidence support them?

Surveying the Unemployed

Fortune Magazine, a publication for businessmen and industrialists, made its own survey relative to unemployment and drew the following conclusions:[6]

1. Are the reliefers bums? No.
2. Have they had much education? No.

Not by any formal standards. The majority of the sample left school either before or at graduation from grammar school. Ten per cent had no education whatsoever. A fifth left school before finishing the fifth grade; another fifth before finishing eighth grade. Still a third fifth quit with a grade-school diploma. Fifteen per cent had "some high school," while only a handful had finished high school or college.

3. Did industry fire them because they could not do their jobs? No.
4. Do they ask for too much help? No.
5. Has industry taken many of them back since 1935? Yes, almost half.
6. Is there a shortage of skilled labor? Yes.
7. Is there an abundance of unskilled labor available to industry that is not being "bid away" by WPA? Yes.
8. Are those remaining on relief "marginal men" in that they are unfit for employment by lack of skill, age, or disability? Yes.
9. Are these "marginal men" unemployable? The unskilled, no; the aged and disabled, probably yes.
10. Is the WPA "spoiling" them and wasting the taxpayers' money? No.
11. Are the local communities doing as good a job of giving direct relief to these unemployables as the Federal Government did two years ago? No.

Lack of Planning

Much of the strife and antagonism caused by the recent "sit-down strikes" is an excellent example of the result of a lack of a long-term employment policy and occupational planning. It had its inception about three hundred years ago and can be traced directly to colonial "indentures."[7] In the early days of this country, the population was sparse, and wage earners were difficult to secure or hold, because of the many opportunities to be an independent worker, due to an abundance of natural resources. Between 1717 and 1775, more than fifty thousand convicts were shipped into this country, over the protests of the colonists, to augment the working forces. Thousands of others were enticed or kidnaped to America by force, fraud, and false claims. After these poor and distraught people had completed their indentures, usually from four to seven years, they received "freedom dues." These "dues" consisted of wearing apparel, an ax, two hoes, and a year's supply of corn. More than half of the total white immigrants of the thirteen colonies came to America under this plan. The freed servants followed the line of least resistance. Many drifted to the mountainous sections of the south and southeast, and settled along coves and rivers. Here they intermarried and interbred, perpetuating their kind in a poor and unhealthy environment, until today they present a serious social and economic problem. The situation is indicated by the following:[8]

"The greatest excess of children is in the rural South. And the heaviest reproduction rates are not, as is sometimes supposed, among Negroes, but among native white Americans. In the southern rural states the number of children under five years old per 1,000 native white women of childbearing age (twenty to forty-four years) is more than double that of Northern industrial regions. . . .

"During the three decades from 1900 to 1930, three and a half million of the people born in the rural states of the Southeast moved to other regions. The education of these rural children, many of whom will be the future citizens of Chicago, New York, and similar metropolitan centers, is a matter of quite as much concern to Northern cities as to Southern counties."

David Cushman Coyle touches on this problem succinctly, when he says:[9]

"Quite likely a sharecropper with hookworm is tenth cousin to the Northern university president, and of equal or superior biologic stock. But however good the stock the environmental factors are important for each particular generation. The highest birth-rates are in the poorest rural families, and in the poorest counties where neither the family nor the county can provide good schools and public health services. These young people, brought up under severe disadvantages, with untrained minds and impaired health, migrate to the cities and become laborers with whom the industrial managers are going to have to sign labor-union contracts. How can we expect them to be "reasonable" when they see a chance to sit-down and get an immediate advantage over the boss? How can we expect them to be farsighted in respect to law and order and to the obtaining of rights and privileges by established democratic processes? They have a long score to settle with society.

" . . . You cannot expect reasonableness in a person if he has a history of poor health, malnutrition, physical inferiority, social humiliation, and the kind of economic insecurity in which the individual is helpless in the clutch of events."

The National Resources Committee

One of the most effective studies to date is that of The National Resources Committee.[10] Their report indicates no decrease in the number of inventions but rather an increase. The report points out the tragic effects of unemployment caused by technological changes. New inventions create as well as destroy jobs. Some innovations have not only made certain occupations obsolete but, also, have destroyed entire industries. Aside from the addition or deletion of jobs due to scientific discoveries and their application to industry, the effects upon the entire social structure (the home, the school, the church, the community, and the nation)

[6] *Fortune Magazine*, "Unemployment in 1937," October, 1937, pp. 101–103.

[7] *Encyclopedia of the Social Sciences*, "Indenture," pp. 644–647.

[8] Embree, Edwin R., "Little Red Schoolhouse, 1938 Model," *The Atlantic Monthly*, November, 1937, p. 638.

[9] Coyle, D. C., "Balance What Budget?," *Harpers Magazine*, October, 1937, p. 455.

[10] The National Resources Committee Report, *Occupations Magazine*, October, 1937, pp. 48, 49.

are significant. The committee recommends the organization of planning agencies to study the social, economic, and occupational effects which are being produced by: The mechanical cotton picker, air conditioning, plastics, the photo-electric cell, artificial cotton and woolen-like fabrics made from cellulose, synthetic rubber, prefabricated houses, facsimile transmission, the automobile trailer, gasoline produced from coal, steep flight aircraft planes, tray agriculture, etc.

A federal report of April 1, 1937, states that American production has been "stepped up" to the point where the same amount of goods can be produced today as in 1929 with 20 per cent less workers. This statement causes an industrialist to say:

"Let us face the issue. Industry will not be able to absorb them for some years to come, despite valiant promises. The problem is beyond industry; it is — and will remain — a social, governmental problem. All the long time trends are relatively downward in industrial employment: fewer manufacturers, more mechanization, greater output per man, fewer number of hours per week, very few old or very young persons employed, fewer unskilled workers."

The Federal Employment Service

Many public and private agencies are busily engaged in attempting to solve these perplexing problems. One of the foremost agencies working on this problem is the Federal Employment Service, which is analyzing occupations, determining work standards, and classifying occupations into "families."

At present, the best work possibilities and opportunities appear to be in the expansion of occupations in such fields as distribution, personal service, health, recreation, conservation, and preservation of our natural resources, etc. As most of these services must be national in scope, to be effective, and are dependent on federal appropriations for support, the outlook is not encouraging. The nation is already harassed by burdensome taxes. Much research and experimentation is needed.

Dr. Herman Schneider, Dean of the College of Engineering and Commerce of the University of Cincinnati, and father of co-operative education in this country, sums up the present dilemma when he says:[11]

" . . . now the country is settled. There is a deal of significance in this simple statement — significance not only in art, but in economics, political science, social science, and the whole gamut of problems in human adjustments.

"The white man's trek is ended. The age-old westward tide of his turbulent push — from Asia across Europe, across the Atlantic, across America — has struck the barriers of the congested Orient and rolled back upon itself. The alluring vistas of unknown lands beyond have vanished forever. The succession of decades when the poor and the oppressed could turn hopefully and doggedly toward the opportunities of the open West, lingers only in our memories. Today, the poor, looking in any direction, see other poor looking their way. We are milling about on one another's toes and stifling in one another's smoke. Romance, which once beckoned a challenge to hardihood and hope, has fled from the near approach of man and left him either to sink by stagnation or to find salvation in his creative and his service impulses.

"The end of the great trek is chock-full of significance for every subdivision of our educational curricula. The problems of contraction are always more vexing than those of expansion. In physics, broadly, contraction develops heat, expansion coolness; the parallel is apt. The problems ahead of us are much more subtle and complex than those behind us. Their solution will require less physical energy and much more intellectual acumen; less forward movement into the geographically unknown and more research into the laws of the physical and social sciences together with critical and constructive development comporting with the laws. . . ."

Studying Vocational Trends

Educators, especially vocational educators, must be cognizant of occupational trends, vocational-training possibilities, employment possibilities, and needs of youth, between the ages of 16–21, who do not plan to go beyond the twelfth or fourteenth year of the public school. It is impossible to state, with any degree of accuracy, the number of occupations for which schools could provide training. With 25,000 different occupations or jobs listed in the last census (1930) an estimate of 5,000 might be a conservative one.

The success of any vocational-training program is dependent upon placement. Besides this problem, however, criteria should be established for measuring its effectiveness. The following are suggestive:[12]

1. Is the organization for carrying on the vocational program effective and proper for the purpose?
2. Are the subjects included in the program of studies the ones which will best meet the needs of those for whom the vocational program is organized?
3. Do pupils for whom vocational courses seem advisable and feasible enroll in the vocational schools?
4. Is the length of a given vocational course in accordance with the amount of training needed for employment?
5. Is the relative amount of time allotted to vocational, related, and general subjects proper?
6. Is equipment suitable and adequate for realizing the objectives of a vocational course?
7. Is instruction suitable for the ends to be attained?
8. Are housing facilities for the vocational classes suitable and adequate for the instruction?
9. Are there proper provisions for auxiliary educational facilities, pupil welfare, and pupil adjustment?
10. Is the cost of the vocational program in keeping with the services needed to provide vocational training for which the public schools have responsibility?

Summarization

1. Education and industry must combine more effectively in the solution of occupational training and employment.
2. Many of our educators speak glibly about "activity programs," "progressive education," "training the child for life," etc.; and at the same time either starve the more practical courses, such as industrial arts (general education) and vocational courses (specific occupational training), or keep them reluctantly in the school curriculums. The humanistic attitude of the colleges is responsible for much of the secondary school's function-less subject-matter content.
3. All of our schools, with the exception of the high school, are foreign importations. The curriculums of the high schools are, also, principally foreign importations. High-school curriculums need to be overhauled and geared to modern life — to the social and economic environment of an industrial civilization and not to a European medievalism.
4. The time is rapidly approaching when every normal person will be occupationally trained and certified regarding his degree of occupational proficiency. Measurements and vocational-guidance techniques will be required to estimate, within reasonable limits, individual aptitudes, capacities, and probable abilities.
5. Research and analysis are needed in the rapidly rising number of occupations; the levels of occupations, i.e., degree of difficulty, both mental and physical; and the probable effects of new inventions and occupations upon the entire social structure.
6. Vocational educators, particularly, must be alert to the advance of science and its practical application to industry: its effects upon occupational life; the obsolesence of occupations and the inception of new ones. Training programs must keep abreast of industry. Thus far, schools have always lagged far behind

[11] Schneider, Herman, *Thirty Years of Educational Pioneering — The Philosophy of the Co-operative System and its Practical Test*, University of Cincinnati, 1935, p. 17.

[12] U. S. Office of Education, *Survey Report, 1935, Cincinnati Public Schools*, Chap. 7, p. 88.

industry. The criticisms of the President's Educational Advisory Council should be drastic enough to spur the vocational authorities to action, with a determination to eradicate many of the existing deficiencies and raise occupational training to the high educational level it deserves.

7. With the federal subsidy for vocational education trebled, vocational educators have their greatest opportunity to expand and modernize their organization. Vision, foresight, creative ability, and a functioning occupational-training program are essentials for success. Failure would undoubtedly transfer vocational training from the present educational authorities to other social agencies. This would likely mean the withdrawal of federal aid. The destiny of public vocational education, of less than college grade, lies in the hands of vocational educators in our public secondary schools.

8. Lastly, there is a possibility that federal aid for vocational education of less than college grade be withdrawn in a relatively short time. Attacks in the federal congress for its continuation have become more frequent and bitter within the past half-dozen years. There are those who believe that agencies outside of the public school could do a more efficient job. Many teachers and educators consider as undemocratic a federal appropriation for a specific type of education. Certain agencies are and have been striving valiantly for a general federal subsidy for education, the money to be prorated to the various states and to be spent as the respective states see fit. If these plans materialize, it is evident that vocational education would be handicapped in many sections of the United States.

Woodworking in the Schools of Tomorrow

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It has long been said that "Coming events cast their shadows before." However, everyone knows there is an element of guesswork in interpreting shadows, and guessing can hardly be a profitable procedure in determining the direction of human effort. That there are shadows, we do not question. We see them in each phase of every undertaking. What they signify for future events is so much conjecture that it is not safe to plan on the basis of what any one of them may portend.

Let's take a look at some of the shadows in the field of what is now called "Industrial Arts." An extensive study on teacher education, recently completed, found this subject referred to by 49 different terms.[1] Another study, made ten years earlier, showed the subject as referred to by 28 titles.[2] What will the situation be at this rate in 1946? Has any one of these names or shadows pointed to the general tendency to say "Industrial Arts"? No, yet the name has been evolving for nearly thirty years.

Since shadows are but imperfect reminders of the existence of something, they can be of no more value than just that. It then becomes necessary to interpret the "something" in another way. How does the weather man know what to tell about the likelihood of rainfall? His forecast is built upon a study of weather records over a long period. It is, therefore, more than a guess as time usually proves.

It shall not be the purpose of this paper to take the reader back over many pages of history in order to substantiate what shall be said of the future of woodshops. However, three significant factors need to be mentioned at the outset as being responsible for their early status:

1. During the first twenty-five years of manual training, the technical-skill objective in woods and drawing predominated.
2. Teachers had varying amounts of technical skill themselves, and little or no professional preparation.
3. Training schools for teachers were few and the work was very technical in character.

Materials Then and Now

The following have been of significance in bringing a different situation: Salaries were higher for teachers of manual training than for other teachers with more professional preparation. A material heritage in technical skills had come down through the centuries with creations in brass, bronze, tin, wrought iron, cast iron, steel, glass, copper, and woods, but during the past thirty years it is estimated that five hundred different materials have evolved in addition to them, out of which man is now creating what he needs. Teachers, and principals as well, have much more professional training and, as a consequence, attention is given as never before to human needs at every age level. A comparatively large number of colleges are preparing teachers for positions in industrial arts with a "general education" objective now predominating.

It was obvious in the beginning that that medium of expression (wood) and the processes with emphasis upon hand skills, with which manual training was advocated by Dr. Runkel at the Massachusetts Institute of Technology and other Boston schools, should dictate equipment. Shops were set up for woodworking and drawing wherever the work was instituted. There was little question about the technical procedure because there were few teachers, or principals, sufficiently grounded in professional knowledge to do any more than mark time, pedagogically. They forced trade training on children before the latter had encountered any vocational needs. It is true that in the early days men with great professional vision, like Woodward and Ham, pointed out greater goals than just woodworking for the sake of skill only.[3]

The question "What knowledge is of most worth?" has recently become the concern of schoolmen — principals and teachers alike. As research brought an increase in professional perspective, vocational woodworking for the average child was seen to be as futile as to force upon him other forms of adult needs. Rousseau had said long before that one could not be a man before he was a child. The "joint-making" epoch of manual training was naturally slated for the discard. Its place was filled by a furniture-making era in which a boy's choice of activity was limited to the drawing and making of a piece of furniture such as was within his ability to undertake. It was a sort of pseudo-vocational preparation. Industrial hand and machine processes were studied and imitated but industrial organization —the heart of industrial production—

[1] Ashley, Lawrence F., *Industrial Arts Education*. Ph.D. Dissertation. The Ohio State University Press, Columbus, 1936, 176 pp.

[2] Warner, William E., *Policies in Industrial Arts Education*. The Ohio State University Press, Columbus, 1928. 90 pp.

[3] See Ashley, Lawrence F., "What Now in Industrial Arts Education," *Education*, October, 1935.

was not. Much good came of manual-arts woodworking and drawing, nevertheless, but if the criterion of general education, namely, that education should consist in the reconstruction of experiences into usable life patterns, were applied, it could easily be seen that furniture construction was presuming to fill all of the adult-life patterns. It not only fell short of furnishing experiences which would be a cross section of life at different age levels, but the work did not live up to its own possibilities. The voluntary study element, which would have given new knowledge and opened new ideas in construction possibilities, was too often lacking.

With general education as a criterion, the vocational emphasis became nothing but an absurdity for the average child. One need but ask himself "How old was I when I felt I had sufficient knowledge to be able to say definitely what I wanted to do the rest of my life?" Most adults will say "25." How many then could select careers as woodworkers while in the teen age?

Wood and What Else?

What could the schools do? They had equipped, some very expensively, for woodworking. To save their faces educationally, they now realized that creative activities with many mediums, such as would have "lead-on" values at any age level, must be introduced. A new term, "Industrial Arts," had already been coined by Bonser better to describe what would fit general-education objectives.

Still, there was the equipment question. Most activity work required a table or bench of some kind at which an individual could work. The manual-training benches already in the shops could serve in most situations. By placing two of them back to back, less room was taken up and wider working surfaces were obtained. Portable machines could be mounted on some for sheet metal, general metalworking, and for woodworking, too. There is no question but that woods lend themselves to creative arts as valuably as do other materials and that the lead-on values are equally dominant. The point here is that the criterion of *What education shall be* will no longer let industrial-arts activities be confined to woods alone.

Will the woodshop of manual-training days soon be a thing of the past? Yes, and no. The so-called technical high schools in the large cities will continue to serve a group of boys who for various reasons have become interested earlier than the average in woodworking vocations. If our subject permitted us to go outside the public high school we could find numerous situations where vocational woodworking would remain profitable, among which would be universities and even teacher's colleges. For most high schools, the change is already here. The old shop, while visibly the same in many places, is no longer used exclusively for woodworking.

Numerous departments have been recently created in hundreds of new school buildings over the country. A strong effort is now being made to organize and equip them for a half-dozen different activities. Portable-type machines and workbenches with large surfaces and built-in metal lockers beneath, are being planned for the woodworking area. The neat appearance of such benches with the six or eight locker compartments beneath resting on a base extending straight down to the floor is in decided contrast to the old-type benches. The need for special wall lockers is obviated. The larger working surface with corner vises is more usable for a variety of activities than those formerly equipped with tool racks in the center.

One need not go into the type of machine equipment for woodwork in the future high-school shop. There are now several suitable makes from which to choose. The principal difference as compared with the shop of 25 years ago is that adequate apparatus is now available at considerably smaller cost and that it requires but a fraction of the space formerly needed. The same may be said regarding the equipment for the other areas in the shop. Most of the hand tools shall continue to find a place because they are not only needed for woodworking, but are equally useful in connection with other types of work.

The General Shop

Much has been written and said regarding organization and pupil personnel in the "general shop." Therefore, further space will not be given to this highly necessary phase of the new shop management. More important than all is the answer to the question: What shall subject matter be like in the future shop?

The answer brings us abruptly to face again our philosophical criterion — what is education for? If we agree that it is a preparation for a safe and sane manner of living, and this seems to have been a universal tendency since Rousseau, or even Plato, then we see that the right to know how to live is as important at the high-school age as it is at any time in adult experience. Therefore, whatever is done must be a preparation for daily life, and so far as it can be foretold, for the future, too. What can woodwork or any other shop activity do for high-school students that will make their lives less embarrassing and better adapted to the general environment? How can it contribute to any future intellectual or vocational need? Unless these questions are kept constantly in mind, the teacher will tend to lapse into the one-activity-at-a-time-all-in-unison concept of the manual-training tradition.

The logical and psychological approaches to the problem of what to do must naturally coincide where general education is concerned, and one finds the "student-interest approach" the key.

Getting the Group Started

Just what is the process of getting started and carrying on to be like? Imagine a group of high-school freshmen before you. Each boy in turn introduces himself, tells something of his life, his home, his daily tasks, and what he likes best to do, or would like best to do if he had the means with which to do it. A group of 25 boys from the same district will be found to have major interests which will come under about five heads such as aviation, travel, electrical work, etc. The major interest of one boy in such a group was printing. A short interview with him brought out the fact that he would like to have an old-fashioned screw-type press like the one Gutenberg used. It was suggested that he go to the library and get what information he could find about it. He returned the next day with a half-dozen books, some of which had good pictures in them.[4] He was then permitted to take pencil, paper, drawing board, T square, triangle, and scale, and plan a working drawing. This was his first attempt at drawing, but with suggestions from the teacher, and a reference text for conventions, he did admirably — even with the screw threads, which he insisted on drawing.

The drawing done, he was ready to select his woods. This was done according to other data in the books. Then the actual woodwork activity began, and construction went forward from simple to complex and with the maximum fascination.

The interests of others in the class were developed in the same manner. Many of them cut across several shop areas from the beginning, and some of them made use of the woods areas last. Each led into books, magazines, and other references.

The recognition of pupil differences, aptitudes, and capacities; the stimulus to initiative in thinking, planning, and creating, are some of the big elements in developing personality for which all educators strive. One finds these outcomes in

[4] *New Practical Cyclopedia*, Appleton-Century, New York City, 1920, Vol. 5, pp. 190–193.
Bachman, F. P., *Great Inventors and Their Inventions*, American Book Co., New York City, 1918, pp. 187–207.
Pictured Encyclopedia, Compton and Co., Chicago, Ill., 1935, Vol. II, pp. 346–348.
Standard Dictionary, Funk and Wagnalls, New York City, 1933, p. 1969.
Holland, Rupert S., *Historic Adventures*, Macrae, Smith Co., Philadelphia, Pa., 1911, p. 295.
The World Book Encyclopedia. W. F. Quarrie Co., Chicago, Ill., 1928, Vol. 9, pp. 5817–5823.

the manner of teaching just illustrated. Future vocational interests which will develop for some in any area as well as in woods, will require further work which will emphasize a greater degree of technical skill and production methods. Since it is entirely possible to get this concentration in a general-shop situation, there need be no special woods laboratory other than the general-shop area for this purpose. Thus is evolved naturally a general-shop situation. The pupils have been led, through discussions about their own personal interests, to delve into books and magazines for ideas which will help them in planning. As fast as adequate plans are on paper, they go to the respective shop areas and create from the materials most suitable, the thing planned.

If there were but one pupil to care for, teaching according to general-shop, pupil-interest, problem-solving method would be as simple as it sounds. It is not so easy, however. Where the teacher of woods had his time pretty well occupied with questions and answers relative to the processes involved, he now finds himself with from four to six times as many activity areas to account for. One is confronted at the outset with the need for organization details not only regarding laboratory arrangement, but individual instruction which is bound otherwise to result in confusion, especially with large classes.

Industrial-Arts Laboratory Arrangement

The laboratory must be arranged with a great deal of thought. Light must be considered. Noise is a factor, and efficient operation of apparatus must be in mind. The sizes of various pieces of raw material which have to be reduced to smaller dimensions require space sufficient to handle in machine operations. The planning area which requires a degree of cleanliness obviously should be as far from the forges and coal smoke as possible. Yet since everyone works in it, and will be constantly moving to and from it, a central location will save steps and cut down on the amount of passing. The finishing area needs to be so located that there will be comparatively little dust and yet a free circulation of air must be provided. Portable-type machines for woods, metals, and printing are adequate for the instruction in these areas. They take up much less space than large-type apparatus and the outlay is only a fraction as great.

The arrangement of hand tools is another item of organization requiring no little thought. Should they be in a toolroom, on a panel, or arranged in portable cabinets? Sometimes any one of these methods may be better than the others. There are a number of controlling factors, not the least of which is the arrangement of the building. Because of the complexity of the problem of suitable organization, the novice in general planning had best call in an expert. Such a person is one who has conducted or is now conducting a successful general-shop situation. Such a person should have done considerable research in philosophy and organization.

Pupil-Personnel Organization

Assuming that the laboratory has been properly arranged and equipped, a pupil-personnel organization needs to be instituted in order that repetition of instruction and routine details do not occupy the instructor so that he cannot confer with individuals or groups. For example, when the instructor has given detailed instruction relative to procedures in the woods area to two or three students, it might be difficult for him to find time to repeat this instruction as other students become ready to work in this area. Therefore, it is better for him to appoint one of the first group to act as a leader, who will convey the instruction he has received about apparatus and materials to others as they come along during the time that he works in this area. Certain students primarily interested in planning, especially the architectural-drafting students, will remain longer in the planning area. One of these may be designated as general superintendent to whom the various leaders may go with their questions on planning. Further organization is necessary in order to keep the apparatus in good condition and for the dispensing of materials. This can be taken care of in about the same manner developed for unit-shop situations. For example, each pupil in the room may be charged with a piece of apparatus or special shop duty which will be thought of in the same light as his classroom work, and he will receive a grade on his care of this apparatus just as he does on his class project.

Since the technical high schools of the larger cities are also public high schools, though of a special character, they require mention at this point. Until quite recently, one found them overflowing with children whose parents insisted upon vocational training regardless of the aptitudes, abilities, and backgrounds which they could command. Here again, thanks to wiser supervision, the general-education criterion is being applied. The result is that the junior-high-school and tenth-year pupils are being moved to other schools and their places taken by upper classmen. Where this cannot be done, the vocational emphasis is being dropped for the younger ones. As for the physical appearance of the shop, there need be no great change. It was set up for a purpose for which there still exists a need. This need can be tested by the number of graduates placed in industry.

Who shall teach in the general shop? Obviously, only one with broad training in technical skills in woods, metals, and the graphic arts. If he knows ceramics and textiles, so much the better. He must also know human nature, character traits, and incentives. He must be an organizer and at the same time a walking fund of knowledge. His position must be understood by the head school officer so that he will be given time without infringement upon it, to develop and carry out a successful program. It is hard to believe in this connection that as late as 1921, 62 per cent of the superintendents in Illinois deliberately exploited their pupils by requiring that the "manual-training teacher" use his students to make and repair school equipment any time such was wanted.[5] If these superintendents live today, they need to get down on their knees and pray the forgiveness of the now grown men whose time they wasted. May the time speed forward to the day when the future director of laboratory work is permitted to have no more hours of classwork than is the academic teacher in the better schools now, in order that pupils will be able to reap the full possibilities that careful preparation and constant attention of the teacher can make possible.

Briefly, the future of woodshops in the high schools in any state depends upon the interpretation of general education values for pupils at various age levels. These values, for psychological reasons, must connote development — growth — culture. Since present indoctrination of teen-age pupils, the woodshop must be more than hand training. Therefore, different methods and more worth-while problems must be used. Since woods no longer constitute a major part of the cross section of modern industrial life, and since there are now so many other mediums for creative expression, then pupil's time cannot be taken wholly with woods. It is, therefore, logical that old-time woodshops on the high-school level be revamped to include equipment areas for activities such as metals, ceramics, electricity, transportation, and communication. The hand tools and part of the bench equipment will still be useful and the outlay for additional apparatus need not be great.

PROBLEM CASES

The boy or girl who is a "problem" in the so-called "academic" class usually remains one in the industrial arts shop and in vocational industrial classes.

— *F. Theodore Struck*

[5]Ashley, Lawrence F., "Manual Arts in Illinois," *The Manual Training Magazine*, July, 1921.

A Point of View

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Industrial arts as a subject in the public schools of the United States may be considered relatively new. Being new, a limited amount of research and testing has to date been carried on in the field. Its newness, in turn, may account for the differences existing in the kind and presentation of content. Assuming, therefore, that no one philosophy of industrial arts has been proved, through research, to be ideal, we take this opportunity of presenting a point of view.

In the early period of our industrial-arts growth, when the purpose was largely that of the development of skills, it was not only possible but desirable to set up extensive lists of specific aims. A review of early literature clearly demonstrates this observation. Such aims, too, could easily be developed and checked off as accomplished under early methods of instruction. Today, however, when our philosophy of industrial arts provides for a general education emphasis, standard lists of specific aims have little value. In fact, such lists become confusing and tend to set straight-jacketed patterns which are undemocratic.

If our aim is general education in nature, the pupil should be the starting point for the selection of projects, activities, and course content. If, as Kilpatrick[1*] says, "education is actually life desirably carried on with ever more conscious intent to improve itself as it goes," then the school must become a place where such actual life situations may be experienced. Such philosophy calls for a general aim sufficiently inclusive to provide the individual personal growth of each and every pupil contacted. Strickler[2] says that: "Individual personal growth is an inclusive term that contains everything that all the previously mentioned objectives mean. It may be explained by the teacher according to his vision and power of expression in terms of the educational needs and development of specific individual pupils. It is a workable, functioning objective that a teacher may acquire and always keep in mind." It will not hamper progress, since it contains no long list of specific items through which we need feel that the individual must eventually be routed in order that every detailed contact be made and the individual's education completed. A general aim provides for that freedom so essential to individual growth. Again, it sets the stage for the closer co-operation or integration between all divisions of a practical arts program and the entire school curriculum. Practice indicates that specific aims hamper programs of integration, while broad generalized aims provide for thinking and action in terms of the whole child. "In most instances," says Vance,[3] "the industrial arts have been formalized to the extent that they have lost their identity, in practice at least, with the objectives that were set up upon their initiation."

*All references refer to identically numbered items in the bibliography at the end of this article.

Determining Course Content

Specific aims imply fixed courses of study. They imply teacher-planned and determined content. That such fixed courses do not always fit pupil needs or make provision for necessary revision is recognized. Strict adherence to standards tends to neglect the individual. McMurry[4] deplored the fact that "our studies tend to grow fixed into logical outlines planned by the adult, and into cut-and-dried processes which do not fit the developing processes of individuals." Griffith[5] questioned whether subject matter always harmonizes with the developing nature of the child. Crawshaw[6] argues that such ordered courses do not treat pupils as thinking individuals, but rather as cogs in a wheel. Powers and Uhl[7] write that such formal curriculum is a short cut which prevents the broadest possible development of the individual. Dewey[8] contends that pedagogical theory has been misinterpreted if it is held to mean handing out only teacher-prepared materials. The situation is made clear by Schweickhard[9] when he states, "That difference in exact content and manner of treatment in the several books available represents fairly the extent to which it is impossible to standardize a course in a given industrial arts subject for all situations."

Pupils should, so far as possible, be encouraged to initiate, select, and execute their own projects. O'Shea[10] contends that "manual training must follow the lead of the child's interests if it would accomplish its specific purpose of experimentation in motor experiences." "Educationally considered," said McMurry,[11] "we believe a child is at his best when planning and executing his own projects, or at least those which engage his full powers."

A coalition between art, crafts, household arts, and industrial arts, in order to effect a closer tie-up of these activities with other curricular offerings for both boys and girls in the grades, the junior and senior high schools, and in out-of-school activities.

Powers and Uhl[12] remind us that, beginning with the pupil's problems does not need to eliminate the acquisition of important knowledge. Such procedure, they say, would help the pupil to compare intelligently his own solution with that of another person and possibly lead to acceptance of a specialist's carefully worded statement.

The pupil should be permitted, under proper guidance and supervision, to work on anything he or she chooses. The extent of pupil activity should be determined by pupil and plant limitations only. To tell a pupil, however, that he or she should not engage in a certain activity is dangerous practice, for have we not many times been favorably surprised by successful returns of attempts of pupils? Is it not true that a pupil must many times try what an instructor believes beyond pupil ability, in order that the instructor may discover latent talents? The boy who now delights and is proficient in the designing of his individual projects would never have known that he possessed such ability had the teacher presented him with a completed drawing of a project. If children are permitted to pursue, with enthusiasm and guidance, immediate interests, it is reasonable to assume that they shall accomplish more than if the activity receives emphasis when the instructor has the proper mind set. The more co-operative the activity growing out of such interest the better it will serve the general aim of education. Pupil interests are sufficiently varied so that if fostered at the time the pupil himself is interested we get better response and certainly need have no fear about covering the subject matter. The value of the activity in which the pupil engages is dependent, as Strickler[13] says, "upon the thoughts, feelings, attitudes and actions it provokes."

That offerings broad enough to meet all

pupil-selected needs should be provided corresponds to the point of view of Bonser.[14] He contended that a variety of activities should be provided, but that those activities which are proposed should meet the test of educational values. Mays,[15] in considering the training which should result from shop activities, pleads for a broader range of activities in order that a breadth of training may be possible. The general shop or industrial-arts laboratory makes provision for such proposed breadth of offerings. Just what these offerings are to be should be determined by the type of work in which pupils are interested. It should contain offerings beyond their interests in order that new interests may be developed. A desirable laboratory would be one in which we find sufficient equipment and supplies to meet the needs of any and all experimental work in which pupils may desire to participate. It should not be felt necessary that all pupils contact all units of work and all materials represented in such laboratory. "It is more important," says Stombaugh,[16] "that a pupil have an opportunity to think through a problem and express himself according to his interpretation than it is for him to rotate through a sequence of adult selected tools and processes."

Related Information

Since we find no call for specific industrial-arts aims or teacher-planned course content, it naturally follows that a set body of related informational content would also not be recommended. It is thought that related information will develop naturally in connection with individual problems. Pupils find a need for information or develop an interest which prompts them to read, observe, to consult with fellow pupils, or to approach the instructor as a final source for further guidance in obtaining needed information. To assign related information just because it is coincident with woodwork, metalwork, or similar activities is not considered necessary. Such information, it is hoped, will grow naturally out of pupil activities when interest is aroused or a need is felt for it. Frasier[17] and Armentrout evidently recognized this point of view when they wrote of eliminating certain phases of traditional subject matter out of consideration for the learner. Dr. Good[18] would determine the amount of such related information and teacher assistance by striking a balance between individual freedom and social adaptation. Paustian[19] suggests that those teachers who give too much related information come no nearer correct procedure than those who do not give any.

There is a feeling, says Strickler,[20] that "it is not what the child does to the material that counts but what happens to him in the doing. . . . He must observe, think, plan and form judgments." Because of this philosophy, information, knowledge, and skills become secondary aims. They are to serve as a means to an end. Consideration of others, co-operation, industry, readiness to assume responsibility, self-reliance, and other similar attitudes and habits are the major outcomes for which the general shop or industrial-arts laboratory should strive. Morrison[21] and Moffitt[22] convey identical beliefs when they contend that we are not producing tradesmen, but developing boys and girls, and that the industrial-arts teacher is not working with materials but with the ambitions and imaginations of their pupils. Burnham[23] maintains that since little of this technical and related information is taken from the schools, the attitudes and habits carried from the schools are of vital importance.

We as industrial-arts teachers speak rather glibly of assisting the individual to develop consumers' knowledge, of giving him or her an insight into labor conditions, and of teaching them certain skills. "The idea has developed," says Stombaugh,[24] "that the trades are so numerous that it is impossible within the province of the school shop to teach all of their processes." One might add that they also change so rapidly that processes and trades now taught may have disappeared before the pupil arrives at the age of employment. Industry, too, tells us that it would rather the schools provide the pupil with a broad general educational background and leave the specific trade training to industry itself. Are we not forgetting that these are deferred values in which a pupil has little if any interest? We speak in terms of child-selected content, yet turn a complete about face and continue to select and to administer large doses of related information having little if any relation to interests at hand. Is it not possible that through our aims and objectives we are again setting up a defense mechanism for our subject? Are we admitting that probably it has little worth-while content and that we need to scour the very borders and outlying areas for sufficient content to justify its retention in the curriculum? Was this not the fault of our early industrial-arts programs? Might it not be better for us to admit the facts and offer industrial arts for what it may actually hold for the pupil? Is it not entirely possible that after we have provided that outlet for manipulative experience, and an honest situation for experimentation on the part of the pupil that we are, in a measure, meeting his needs? Too, that if we provide an outlet for pupil interests we will in turn be meeting the aims of general education? Again, if shop situations provide for the actual practice of social relationships between boys and girls, if they provide for the information called consumers' knowledge or exploratory values, or provide specialization for those few pupils who may desire it, is it not entirely possible that industrial arts may justify its existence? Certainly this is in line with the modern trends in psychology when we infer that interest whets the appetite for learning and that immediate life situations offer spice to any learning situation. Research indicates that attempts to teach deferred values are least successful. If we could but cast aside our past thinking and experience in formal course content and make an about face in favor of pupil interest, pupil-thinking situations, and the more subjective outcomes as industry, consideration of others, appreciations, and the many other wholesome attitudes, in place of projects and course content, it is possible that advocates of industrial arts would need to have no qualms regarding the worth of the subject.

Participation in Social Relationship

The author set up an experimental situation to determine whether the industrial-arts shop provides for participation of such qualities as consideration of others, co-operation, industry, observation, readiness to assume responsibility, and self-reliance. Paired groups were observed in a formal situation of a teacher-determined content shop and in a pupil-determined content shop. In the first, instruction was very formal; in the second, all the freedom indicated in the previous discussion was permitted. The unpublished results present some very interesting findings. Both shops provide a degree of participation in the qualities listed in the foregoing. It will be interesting to note that in all qualities but consideration of others the pupil-determined shop provided for the most possible participation. Longer periods of demonstration in the teacher-determined shop brought the number of observations for consideration of others up. A category for extraneous activity, interpreted loafing, was included. Contrary to the belief of some, the pupil-determined content shop, or the rather free activity shop, showed the lowest provision for participation in this category. There was an indication that pupil choice of activity instilled an element of interest which caused the individual to concentrate on his work. There seemed to be a difference in the spirit with which a pupil approached his self-initiated work as contrasted with the assigned activity. One exhibited a drive as against an apparent forced attention. In the teacher-determined content shop, individuals were listless as compared with a dynamic application on the part of pupils in the pupil-determined content shop.

It should be the purpose of the industrial-arts laboratory to capitalize pupil interest with better self-expression as an end. This purpose still holds the pupil responsible for the outcomes of the activities originating through such interests.

Giving Information When Need for It Arises

Tool information, related information, and guidance should be given to the individual pupil when the need arises and the pupil is, therefore, ready and receptive. Such need may be indicated by the pupil or may be suggested by the instructor when he observes or anticipates an apparent faulty procedure which might endanger the pupil or the machine. This philosophy precludes the giving of class demonstrations at set intervals. It precludes the instructor selecting and determining upon the demonstration content. The teacher in attempting to make everything clear, Trybom[25] concludes, is likely to give so much information that little independent thought on the part of the pupil is aroused. Too, the pupil having no immediate need for this knowledge will probably not make the proper application or even remember the demonstration when he experiences the need for similar information and knowledge. We, therefore, believe that making the information available when the need arises, proves to be the most effective method of instruction.

It is hoped that experimental situations, stimulating mental activity, may be encouraged. When, however, too much emphasis is placed upon skills, it becomes evident that the mental stimulation must suffer. Since, after all, many tool operations may be performed successfully in several different ways, it may not be highly important to insist upon *a* way or *a* method. Since skill is considered secondary, pupils should be permitted to try their abilities in planning their own projects. Pupils selecting and developing their own projects must deal with such a venture experimentally, if at all. Strickler[26] contends that "the essentials of industrial-arts experimentation are to set one's own problems, to work out one's own plans in the light of all the information that he can find himself from his past experience, from his fellow pupils, teachers, magazines, and reference books, and then, finally, to execute these plans himself. . . . An experiment is something to be tried out. It does not have to succeed. Positive learnings may accrue even from negative results. . . . The important thing is what one does with his mistakes. He may give up or he may experiment further and turn seeming failure into distinct achievement. After children are protected against certain dangers in the use of materials and machines, little harm and endless value can come to them through thoughtful experimentation." Judd[27] believes that, "impressions made by failure produce deeper thought, inspire new resolutions, and energize will power. . . . by his [the pupil] failure he gains a mastery over himself and thus unconsciously lays a foundation of sound judgment. . . ." The importance of such experimentation was recognized by Bonser[28] when he cited the almost total neglect for its provision in the curriculum. Permitting the pupil to discover some things for himself, instead of telling him everything, is a shop procedure to which Schweickhard[29] would subscribe. Munro[30] holds that things discovered by the pupil have much greater value than those prepared for him, requiring only acceptance on his part. McMurry[31] stated that "the conviction is very strong among teachers and thinkers that the experimental basis of knowledge should be keen and strong and definite." "Practical decision as to which of several ends to employ," says Strickler,[32] "is best developed by the experimental attitude of mind. An individual brought into contact with a wholly new situation must deal with it experimentally insofar as he deals with it at all. An adult will try to get an understanding of it in terms of what it is composed, what he can do with it, and what it may do to him. . . . Why he should try to keep children from getting involved in such situations by giving them all of his knowledge and by solicitously directing every step is something of a mystery." It seems then that the program should afford much opportunity for investigation and experimentation. An outlet for the investigative impulse should be supplied.

With this type of freedom permitted, pupils may make extended observations of others at work with machines, tools, and materials. Thus they experience not only the operations, materials, and the related information encompassed by their own activity but a large additional sampling of the activities taking place all around them. Since seeing the operations is as important as doing them, Snedden and Warner [33] make the observation that all activities should be made visible to the entire class. "Industrial-arts work demands considered observation," says Strickler,[34] "a process little used in most subjects studied. . . . Data must come from direct observation. We want resourcefulness in the use of knowledge. . . . Processes that can be observed and tried out test mental agility and adaptability."

Shop environments ought to be congenial and satisfying to the pupils as individuals and groups. This condition of congeniality is brought about through freedom, freedom in selection of activity, freedom in the use of materials and equipment, and freedom in shop conduct. It may be further provided through appropriate equipment efficiently and artistically arranged. It would seem that industrial-arts laboratories would many times be made more congenial through elimination of trash, and some attempt at beautification. It is possible that pictures are as essential in an industrial-arts laboratory as in other classrooms.

With a minimum of grouped instruction, teaching becomes largely one of individual guidance. The procedure necessitates a high degree of ability to sense needs and to determine just when and how much help to give. Snedden and Warner[35] go so far as to say that the ideal condition would be to practically eliminate class instruction and give preference to individual instruction which would consist of occasional guidance with the major emphasis on self-direction and self-education. Morrison[36] thinks of education as guidance instead of a process of imparting knowledge.

Individual Instruction

Instruction on the basis of individual needs, eliminates, to a large extent, group lectures or demonstrations. After all, say Frasier and Armentrout,[37] "lectures do not educate, but the responses of the individual pupils do." Kilpatrick[38] thinks that "information presented when and because it is needed will again serve the needs in the life of the individual." Hamilton[39] contends that "the traditional process of trying to build up a background of technic before opportunity is given for expression is wholly unpsychological."

When goals and outcomes are expressed in terms of individuals in place of groups, tests as tests have little value. Since the individual is placed in competition with himself or herself, grades or judgments of pupils are based upon individual progress. Tests, too, are difficult to administer in an industrial-arts situation described in this philosophy, since pupils differ widely in experiences. Power and Uhl[40] recommend that "the pupil set his own standards." It is the responsibility of the instructor, however, to see that the student grows in his desires to produce nothing but his best. Griffith[41] felt that "expressional manual arts had fulfilled their mission when a pupil had expressed his ideas sufficiently clear that other members of the class might interpret his purpose."

Industrial Arts for Both Boys and Girls

If we believe that general education is essential for girls as well as for boys then we must in turn admit that industrial arts, being general education, is as good or worth while for girls as it is for boys.

Likewise the application may be made to home economics and all school subjects. Watching boys and girls at play soon points out the fallacy of attempting, even in a curriculum, to separate practical-arts content and prescribe a portion for boys only and another for girls only. The observation clearly shows that these activities are closely interwoven and that in play both boys and girls participate in them. Just why a boy should be denied a request for being permitted to cook, or a girl to do wood turning is difficult to justify. Under such restrictions, one would never have located the eighth-grade girl who did a piece of wood turning which even the high-school boys envied, nor would one have had the pleasure of watching a boy and girl make plans and execute them for a pushmobile. Boys and girls enjoy working together. Mixed groups improve teaching situations in that boys and girls may help one another over the humps. Experience makes the writer feel that at certain ages mixed groups offer fewer disciplinary problems than do segregated classes. The mixed group is a better unit for real socialization experiences. There are common interest problems concerning the home, the school, and life situations in general which can profitably be taken up with mixed groups of boys and girls. These very boys and girls organize themselves into out-of-school groups, natural organization growing out of ability expressed, we admit, but nevertheless organization. Such natural organization of out-of-school play groups indicates child love for and adaptability to social situations. A general shop provides a natural and an ideal situation for the furtherance of such experience. With many activities represented, large class enrollments, and much detail work to be performed in keeping a shop and its equipment and supplies in order, much opportunity for pupil responsibility presents itself. Experience indicates that boys and girls are happier in a situation where some of the responsibility is delegated to them. Much of the routine work and even class conduct can, very successfully, be turned over to the boys and girls themselves. Call it what we may, or assign designating titles you choose, the function of the organization is the same. It should provide an outlet for the practicing of pupil-selected leadership and co-operation.

Avocational Interests

The industrial arts offer much of value for the development of avocational interest. When we compare out-of-school pupil interests and activities with industrial-arts content we readily recognize their similarity. This being true, we question the limited use to which industrial-arts laboratories are sometimes put. It is difficult to justify the isolation of shop facilities for even one period of the school day and especially before and after school hours. Boys and girls plead for permission to work in shops during vacant periods or during out-of-school hours. Since not all boys and girls of any community have home workshop facilities available, it would seem they have some justification for such requests. Is it not possible that we, as industrial-arts instructors, pass up many worth-while opportunities of making our departments more efficient through participation in such activities as club work and through guidance in the use of home workshop facilities? We hear much regarding the value of hobby or avocational interests. It has also been demonstrated that unless we learn how to play when we are young that such pleasure and the appreciations developing through play may never be counted ours. What of camp craft programs? Are we giving the help we should be giving? Have we a responsibility to assist boys and girls to properly evaluate and make use of leisure? Have we a responsibility in acquainting them with many activities in order that their leisure may be wisely and happily spent? Leisure is, however, not a problem to be considered in terms of the adolescent alone. What is our responsibility toward the adult? Have federal emergency education programs not clearly demonstrated that the industrial arts have a place in adult-education programs?

It is possible, too, that industrial arts may develop appreciations on a par with general art courses. The writer is convinced that appreciations developed through the manipulative experiences in a general-shop course might be deeper and more lasting than those acquired in an appreciations course without the manipulation. If this is true, why not make the general shop available to whoever may care to elect this type of experience?

Freedom of such election should hold true through junior and senior high school and also college. In other words, the author proposes industrial-arts work for not only industrial-arts students but for anyone who may wish to contact such experiences.

Integration with subject matter from other departments helps to enrich both academic and industrial-arts content. Integration, too, makes it not only desirable but wholly necessary that boys and girls be permitted to participate in any or all curriculum offerings of a school. Integration should, however, not stop with school curricular contacts only. There is the possibility of tying up the industrial-arts work with out-of-school clubs, camp craft work, and adult leisure-time classes. After all, integration in its most worth-while aspects is that of the integration of the individual himself.

A proposed program which to the writer seems most ideally to provide this boy-girl activity and individual pupil integration follows. It is our belief that if integration of other subjects with the practical arts is actually to function, we must first of all begin knitting the activities within this department more closely together. We believe that only after such harmony exists will we be able to make our fullest contribution to the work of other departments in the public-school system, to individual integration, and to out-of-school pupil interests and activities. Recognizing this need we have set about building a program which we hope shall demonstrate the philosophy presented in this article. This philosophy, to date limited in practice, has, however, demonstrated sufficient value to warrant the planning of a new physical plant. Such a plant will provide a physical unit with an art and drawing area as a core. Around this art and drawing area are to be located such areas as household arts, industrial arts, and crafts. The industrial-arts area is to contain all customary general-shop units plus such crafts as art metal, ceramics, leather, textiles, and photography. The household-arts area is to consist of one large general room in which sewing, demonstrations, menu planning, and general discussion may be carried on. Around this general household-arts center is to be located kitchen, laundry, bath, and bedroom with movable partitions. Access will be provided from the household-arts area to the art and drawing area so that pupils from household arts may use the art and drawing area at any time. Glass partitions and doors will make it possible for the household-arts teacher to observe pupils at work in the art and drawing area while she herself is conducting work in the household-arts area. The art and drawing area is also to be accessible to all units of crafts and industrial arts. Except for such cases where blank wall space needs to be provided for blackboards, bulletin boards, or built-in cupboards, all partitions are of glass. This type of arrangement emphasizes the unity hoped for in the practical arts. Plenty of doors are provided for freedom of movement between areas of the practical-arts department.

The philosophy includes all that has been set forth in this chapter. It attempts to put it into practice through, first, a very close integration of the practical arts consisting of art, crafts, household arts, and industrial arts; secondly, through a very

intimate tie-up with the elementary grades; and thirdly, through every possible opportunity of integrating the practical-arts work with other curricular offerings of the junior and senior high school, and out-of-school activities.

Integrating Industrial Arts with Other Subjects

It is intended, for example, that all of the seventh grade of 80 pupils be assigned to the practical-arts department for one period. These pupils, boys and girls, will be permitted to do work in any unit of the practical-arts department at any time he or she chooses. That is, the pupil will determine when and where he or she is to be engaged. This is the same philosophy now in operation in a number of the industrial-arts laboratories, but we propose extending it through industrial arts, household arts, art, and the crafts. Pupil selection of activity, with observation, permits his or her beginning with immediate interests and progressing throughout the entire department, as interests stimulate action in any order he or she prefers. The physical setup also permits of closer co-operation among faculty members, thus making faculty conferences at all times possible in order that pupil needs may be immediately met. Experience has taught us that an integrated program which actually functions must provide for frequent teacher contacts. The whole plan provides for more general types of projects or problems on the part of pupils and thus a more nearly desirable experimental situation. A physical plant which makes this possible, even during class periods, should be of great value in the success of an integrated program. Other grades of the junior and senior high school will follow identical shop procedures.

The plan provides for an art teacher, a household-arts teacher, and an industrial-arts teacher to be available at all periods during the school day. It is hoped that the art teacher may function throughout the entire practical-arts department. Having the department fully staffed during all periods of the school day also provides practical-arts laboratory facilities for pupils not regularly enrolled, for co-operation with groups from other curricular offerings, and a closer co-operation with the elementary grades. Limited equipment will be installed with a view to meeting needs of the elementary grades. Elementary-grade rooms are, at present, equipped with individual workrooms and a limited number of hand tools and supplies. We believe that elementary pupils under proper supervision in the large practical-arts laboratory, will have needs more efficiently met and new interests aroused which would be cared for in a limited way only through a separate elementary industrial-arts room. Too, we believe that such elementary industrial-arts work as can successfully be conducted in the adjoining grade workrooms, in conjunction with grade activities, is most effective. Practice in our school points to this procedure as favorable. Such procedure prepares elementary pupils for future practical-arts experience, extends our practical arts into the grades, and helps to meet their immediate needs.

We find that many units of work in junior and senior high school which originate in academic curricular offerings do not make the desirable contacts with household arts, or industrial arts because their unit of work includes samplings of many practical-arts units which are, at present, too scattered and time consuming for effective use. Such units of work should be very effectively cared for in the new setup. With one large department, and a staff available at all periods during the school day, it should be possible for academic subjects to make better use of our offerings. It seems that such a program, with its underlying philosophy, would be a great help in making the practical arts a very potent element as an integrating factor of curriculum content.

Bibliography

1. Kilpatrick, William H., *Our Educational Task,* Chapel Hill, University of North Carolina Press, 1930, pp. vi, vii.
2. Strickler, Fred. (Manuscript in preparation for publication.)
3. Vance, C. E., "Industrial Arts from the Viewpoint of the Superintendent," *Industrial Education Magazine,* 37:57–63, March, 1935.
4. McMurry, Chas. A., *Teaching by Projects,* The Macmillan Co., New York, 1930, p. 184.
5. Griffith, I. S., *Teaching Manual and Industrial Arts,* The Manual Arts Press, Peoria, Ill., 1920, p. 92.
6. Crawshaw, Fred D., *Manual Arts for Vocational Ends,* The Manual Arts Press, Peoria, Ill., 1912, p. 34.
7. Powers, Francis F. and Uhl, Wm. L., *Psychological Principles of Education,* The Century Company, New York, 1933, p. 313.
8. Dewey, John, *Democracy and Education,* The Macmillan Co., New York, 1916, pp. 199, 200.
9. Schweickhard, Dean M., *Industrial Arts in Education,* The Manual Arts Press, Peoria, Ill., 1929, p. 200.
10. O'Shea, M. V., "Some Aspects of Manual Training," *Manual Training Magazine,* I:59–69, January, 1900.
11. McMurry, Chas. A., *Ibid.,* p. 2.
12. Powers, Francis F. and Uhl, Wm. L., *Ibid.,* p. 314.
13. Strickler, Fred, *Industrial Arts — A Fundamental in Education.* Reprint of a paper presented to the members of the Eastern Arts Association, Washington, D. C., April 28, 1933.
14. Bonser, Frederick G., *Industrial Arts for Public School Administrators,* Bureau of Publications, Teachers College, Columbia University, New York, 1930, pp. 53, 54.
15. Mays, Arthur B., "Industrial Education and This Age," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 23:169, May, 1934.
16. Stombaugh, Ray, *A Survey of the Movements Culminating in Industrial Arts Education in Secondary Schools,* Bureau of Publications, Teachers College, Columbia University, New York, 1936, p. 132.
17. Frasier, G. W. and Armentrout, W. D., *An Introduction to Education.* Scott, Foresman, Chicago, 1927, p. 173.
18. Good, Carter V., "Research in Secondary School Methods," *Journal of Research,* 22:9–30, June, 1930.
19. Paustian, H. John, "Related Information Material," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 22:10–12, January, 1933.
20. Strickler, Fred. (Manuscript in preparation for publication.)
21. Morrison, Henry C., *The Practice of Teaching in the Secondary School,* Chicago University Press, Chicago, Ill., 1926, p. 457.
22. Moffitt, Frederick J., "Interpreting the Industrial Arts," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, pp. 116–119, March, 1934.
23. Burnham, Wm. H., *The Normal Mind,* D. Appleton and Co., New York, p. 293.
24. Stombaugh, Ray, *Ibid.,* p. 132.
25. Trybom, J. H., *Sloyd as an Educational Subject.* N. E. A. Proceedings and Addresses, 1892, pp. 455–461.
26. Strickler, Fred, *Industrial Arts — A Fundamental in Education.* Reprint of a paper presented to the members of the Eastern Arts Association, Washington, D. C., April 28, 1933.
27. Judd, J. H., "School Craft and the Educational Value of Doing Wrong," *Manual Training Magazine,* 12:415–424, June, 1911.
28. Bonser, Frederick G., *Ibid.,* p. 6.
29. Schweickhard, Dean M., *Ibid.,* p. 21.
30. Munro, Thomas, "A Constructive Program for Art" (in Dewey, John, *Art and Education,* The Barnes Foundation Press, 1929), p. 219.
31. McMurry, Chas. A., *Ibid.,* p. 69.
32. Strickler, Fred., *Ibid.*
33. Snedden, David and Warner, W. E., *Reconstruction of Industrial Arts Courses.* Bureau of Publications, Teachers College, Columbia University, New York, 1927, p. 68.
34. Strickler, Fred, *Ibid.*
35. Snedden, David and Warner, W. E., *Ibid.,* pp. 69 and 72.
36. Morrison, J. C., "Trends in Educational Method," *Educational Method,* December, 1933, p. 137.
37. Frasier, G. W. and Armentrout, W. D., *Ibid.,* p. 159.
38. Kilpatrick, William H., *Foundations of Method.* Informal Talks on Teaching, The Macmillan Co., New York, 1925, p. 278.
39. Hamilton, A. J., *Integration in Education,* National Educational Association Proceedings, 1931:446–7.
40. Powers, Francis F. and Uhl, Willis L., *Ibid.,* p. 251.
41. Griffith, I. S., *Ibid.,* p. 197.

Industrial-Arts Laboratory Planning — IV

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This is the last of a series on the difficult problem of planning an industrial-arts laboratory.

Research Needed in Laboratory Planning

In nearly all of these matters, even in the field of lighting, much research is yet needed before we can begin to think of calling ourselves scientific educators. Empirical opinion and subjective judgment should wherever possible be replaced by science and fact. From 100 to 200 pieces of research projects could well be inaugurated in the field of laboratory planning.

What we don't know is far greater than what we do know. It is, therefore, hoped that no one will take the suggestions which appeared in this series, with any degree of finality, but that all of the ideas will be questioned and that data will be secured which will enable us to answer each item with some degree of finality.

In the past, much of the research pertaining to laboratory planning has been largely a validation of practices which already existed. That is, we have taken present practices as standards rather than that we have looked forward to ideal conditions. To be sure, most graduate research students have not done this consciously — it has been rather an unconscious process. For instance, in one study which was made of fifty drawing laboratories, the investigator summarized lighting conditions as he found them, and there was very much of a tendency to take the average of his findings as standard. A more ideal procedure would have been, of course, to conduct a study with a great many intensities of light in order to see what conditions of lighting were conducive to maximum pupil performance.

Humanity, regardless of where we find it, changes slowly. We still find a very large percentage of research being attempted by means of questionnaires. It is very doubtful if ideals can be set up by using this kind of research. As one of our authorities has remarked, "The ignorance of one man is no better than the ignorance of a thousand."

We don't like to change our ways. It just isn't "in the wood." Even science has been used to wrong ends. Statistical procedures have been very largely concerned with establishing norms and justifying an antiquated past. Science should be used to assist philosophy in creating and guiding our imagination to a better and more wholesome future. Especially is this true in the field of laboratory planning, where so many scientific applications are permissible.

A decided handicap in making an application of science to the field of laboratory planning is to be found in the fact that very few industrial-arts teachers or leaders can be found who have a scientific background. Before we can make the progress which is to be ultimately desired, we are going to need men who have a background in several fields of education. More and more in all of the professions we find that progress is dependent upon knowledge in other fields. As industrial-arts teachers, we may no longer pooh-pooh science, or art, or psychology, or philosophy, or physiology, or physics. It just may not be done. If we do, we perish. Natural law simply cannot be flouted.

Most graduate research students would find it decidedly to the advantage of the profession if they were able to locate pertinent knowledge which is already in the library. Not long ago, I had the opportunity to assist a printing teacher who was making a study of lighting conditions favorable to hand composition. I did not have the opportunity myself to assist in locating the reference material in the library, but I was sure that it was there. He, however, reported that no material could be found. I have since found that his study was practically valueless and out of date, simply because he did not use the best information which was already close at hand. His experiment could have been worth a great deal more with no additional work had he been willing to look more thoroughly for scientific information pertaining to his problem.

Difficulties Encountered

Another handicap under which industrial-arts education is laboring at the present time so far as research in laboratory planning is concerned, is that there is no laboratory in the United States which is at all adequate for research purposes in the field of laboratory planning. To be sure, we now find many people who are acquainted with the measurement of light intensity, but that is about all. As applied to industrial-arts laboratories, we have had but a little research on the distribution of light, and on the quality of light. We know little or nothing about the measurement of eyestrain, of eye difficulties, and of applications from an illumination engineer's standpoint. Our lights which we have in the center of the room have been inherited from a kerosene-lamp age. Some of them are even made to look like the old tallow candle. Surely this is not what we would call progress!

Our graduate students who would do research in laboratory planning should be able to measure the various qualities of sound, sound absorption, sound transmission, nervous strain, and muscular tension caused by unnecessary sounds. We should set up a work-efficiency measurement program not in terms of piece work, but in terms of lifelong professional service.

Each machine which we have in our industrial-arts laboratories should be studied for its noise-making propensities, and the whole inventory of common equipment may need to be redesigned. We need some standards in regard to machine design from the acoustical and aesthetic standpoint.

It is doubtful whether we have begun to arrange our shops from a maximum-efficiency angle. We must study the shop from a "path-of-travel" and convenience standpoint. Now that the "electric eye" is available, this could easily be done mechanically if the laboratory equipment were available for research students.

In this laboratory for research should be found all kinds of electrical instruments which are used in the measurement of ideal conditions existing in industrial-arts laboratories. We must be scientists in every sense of the word. As it is now, we depend very largely on the questionnaire. We are only "babes in the woods" as far as real research is concerned.

We yet know practically nothing about the measurement of the attitudes, ideals, and emotions, as far as laboratory planning and shop organization are concerned. It is the writer's belief that along with the teacher, the physical environment does a great deal to make people happy and

energetic in their work. In other words, we need to make many controlled experiments.

Our research, if it is to be real research, is many times more complicated than the research of the ordinary scientist. This is because we are applying scientific research to social situations where there are many more variables than, for instance, in the laboratory experiment of the physicist or of the chemist.

A great and thoroughly equipped laboratory is needed before we will be able to answer many of the questions in regard to laboratory planning with any degree of finality. Industrial-arts teachers would be money ahead if every one of them would contribute a sum of money toward such research. A few of the problems which occur to the writer and which need solution are as follows. It should be considered, however, that each of the problems is entirely too large for final answer by any one man, and that several problems could be based on each one of the topics as listed.

Problems Which Need Study

1. What school administrators should know about laboratory planning in industrial education.
2. What the architect should know about laboratory planning in industrial-arts education.
3. Factors making for the attractiveness of the industrial-arts display case.
4. A determination of the factors conducive to securing adequate light in the portion of industrial-arts laboratories farthest from natural light sources.
5. Experiments to determine the feasibility of "white blackboards" and black chalk so as to reduce absorption of light.
6. Extent to which pupils in a room reduce light on working areas.
7. Light as a factor in the reduction of pupil errors in industrial-arts education.
8. Light as a factor in reducing accidents in industrial-arts education.
9. Controlled constant intensity and pupil output in industrial-arts education.
10. Glare and its effect on pupil output in industrial-arts education.
11. Light quality and its effect on pupil performance in industrial-arts education.
12. Experiments with various types of window shades to determine greatest effectiveness in cutting down glare and yet maintaining highest average light intensity.
13. Factors conducive to the aesthetic appearance of the industrial-arts laboratory.
14. An analysis of dust content of air in industrial-arts laboratories.
15. Factors contributing to dust content in wood-finishing rooms.
16. Effectiveness of various devices and mechanisms for reducing dust content in wood-finishing rooms.
17. The humidity index in the average industrial-arts laboratory with recommendations for more ideal conditions.
18. The effect of concrete floors on teacher and pupil fatigue.
19. Indirect lighting versus direct lighting in terms of eyestrain and fatigue.
20. Experiments to determine proper relative facing of pupils with reference to natural lighting in drafting rooms.
21. An experimental study to determine the type of floor most desirable in industrial-arts laboratories.
22. Factors influencing noise reflections in industrial-arts laboratories.
23. Factors influencing isolation of noise in industrial-arts laboratories.
24. Factors influencing the absorption of noise in industrial-arts laboratories.
25. Design of a table saw conducive to minimum noise.
26. Jointer design conducive to minimum noise.
27. Shaper design conducive to minimum noise.
28. Effects of noise on pupil efficiency in industrial-arts education.
29. Anvil design conducive to minimum noise.
30. Ceiling design of industrial-arts laboratories conducive to minimum noise transmission and reflection.
31. Wall design conducive to minimum noise transmission.
32. Motor and machine mounting conducive to minimum noise transmission.
33. Factors contributing to quiet ceramic-kiln operation.
34. Reduction of foundry furnace noises in industrial-arts laboratories.
35. Resiliency in floors as a factor in teacher and pupil fatigue.
36. Factors contributing to minimum accident rate in industrial-arts laboratories.
37. Arc welding and eyestrain of industrial-arts pupils.
38. Acetylene welding and pupil eyestrain in industrial-arts classes.
39. Comparative pupil performance in an ordinary industrial-arts shop and in one maintained at an optimum, uniform temperature.
40. Formulation of ideal principles of lighting control for industrial-arts laboratories.
41. Class organization conducive to minimum production of noise.
42. Principles of industrial-arts machine design which are conducive to minimum noise.
43. Window design to eliminate outside noises.
44. Structural glass as a factor in increasing light intensities in industrial-arts laboratories.
45. Design of hammers and pounding devices conducive to minimum noise production.
46. Methods of metal-products fabrication conducive to maximum quiet.
47. Analysis of lighting in fifty industrial-arts laboratories with ideal recommendations.
48. Bench-top design conducive to maximum quiet.
49. Industrial-arts equipment design from an aesthetic viewpoint.
50. Gas and foul air content in industrial-arts laboratories, and their effect on teacher and pupil fatigue.
51. A recommended science course for industrial-arts graduate students which would equip them to perform scientific studies of physical, physiological, and psychological factors pertaining to variables in industrial-arts laboratories.

Selected References on Laboratory Planning

1. Abbott, L. R., "Space Around Woodworking Benches," *Industrial Education Magazine*, 27:341, April, 1926.

A contribution from the experience of the shop teachers in Grand Rapids, Mich.

2. Albert F. C., "Scholarship Improved by Light," *Transactions of Illumination Engineering Society*, 28:866–875, 1933.

Reports a test made in two similar rooms in Tuscumbia, Ala. In one room, regular lights were used and were manually controlled. In the other room, indirect light controlled by a photo-electric was used. Over a three-year period, many fewer pupils failed in the room with automatically controlled intensity of light of a much better quality.

3. Ashley, L. F., "A New Practical Arts Building," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 19: 173, 174, May, 1930.

A description of the practical arts building, including floor plans, at Eastern Illinois State Teachers College.

4. Badger, O. B., "Planning a Shop Building for a Junior High School," *Industrial Education Magazine*, 31:381–385, April, 1930.

Discusses some general points to keep in mind in planning a shop in a junior high school.

5. Bates, Henry B., "Industrial and School Lighting," *Transactions of Illuminating Engineering Society*, 29:866–877, 1934.

Reports a controlled classroom experiment. Twenty-eight per cent gain on achievement tests was reported for the room having adequate light automatically controlled.

6. Bedell, Earl L., "The General Shop: Its Function and Purpose," *Industrial Education Magazine*, 30:168–170, November, 1928.

Gives objectives and basic principles of general shop organization.

7. Bedell, Earl L., "Specifying Equipment and Supplies for School Shops," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 19:163–167, May, 1930.

Suggestions for specifying machines, hand tools, and supplies for the school shop.

8. Bible, R. C., "An Efficient Tool-room System," *Industrial Education Magazine*, 35:10, July, 1933.

Pictures of tool racks, drawers, and cabinets with a discussion of a tool-checking system.

9. Bollinger, Elroy W., "Securing the Right Kind of Light," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 22:135–141, March, 1933.

An excellent article. Defines terms used by illuminating engineers; gives reflection factors of different colored paints. Discusses the measurement of light, lighting fixtures, lighting design; gives a table of recommended light intensities for various kinds of work. Con-

siders maintenance of the lighting system.

10. Bruce Publishing Company, *Bruce's School Shop Annual*, 1928, 1929, 1930, 1931, and 1932. The Company, Milwaukee, Wis.

These books contain many laboratory plans, lists of equipment, photographs of laboratories, illustrations of commercial equipment, and articles pertaining in general to the problem of shop planning.

11. Brace, George M., "Wall Racks for General Tools," *Industrial Education Magazine*, 31:376, 377, April, 1930.

Discussion and illustration of the cabinet type of tool rack, built-in tool cabinets, and portable tool racks.

12. Byrne, Lee, *Check-list Materials for Public School Building Specifications*, Teachers College, Columbia University, New York City. 1931. 195 p. (Not very usable.)

13. Dobbins, William K., "Lighting problems of the Evening Industrial Class," *Industrial Education Magazine*, 32:338–340, April, 1931.

Direct versus indirect lighting; technical terms defined; minimum standards; the utilization constant; developments in illumination. Brief.

14. Donovan, John J., *A Method of Procedure and Checking Schedule for Planning School Buildings and Their Equipment*, Bruce Publishing Company, Milwaukee, 1932, 361 pp.

Gives 78 pages of items to check when planning the rooms for an industrial-arts department. Suggestive.

15. Donovan, John J., "Little but Important Things Often Forgotten in Schoolhouse Planning," *American School Board Journal*, 78:39, 40, January, 1929. Also 78:53, 54, February, 1929.

Lists of a good many details which are easy to forget. Of value as a check list for anyone who is planning a school building or any part thereof.

16. Duffield, Thomas J., "Modern School Ventilation," *Architectural Forum*, 55:755–758, December, 1931.

Discusses humidity and temperature control, drafts and ventilation, thermostats and what to keep in mind when selecting a ventilating system.

17. Editorial, "Equipment Problems," *Industrial Education Magazine*, 27:305–307, April, 1936.

Some good ideas on equipment economy, efficiency, and care of equipment.

18. Editorial, "Heating and Air Conditioning," *Architectural Forum*, 62:91, 92, January, 1935.

Gives an excellent set of requirements which a heating and air-conditioning system for schools must meet if it is to be ideal. Lists several advantages of such a system. Gives several implications for the school architect.

19. Editorial, "Lighting Standards and Equipment," *Architectural Forum*, 62:92–95, January, 1935.

Shows present lighting installations in schools to be entirely inadequate. Graphs show the increased length of time necessary for seeing when light is poor, penalties to persons with astigmatic eyes when lighting is inadequate, increase in eye benefit and work benefit when lighting is adequate. Discusses minimum intensity, light glare, distribution of light, and color of light. Gives an excellent check list for various types of school lighting. Recommends a minimum of 25 foot-candles for drawing rooms. Clear understandable graphs are of value.

20. Editorial, "Making Noisy Motors Operate Quietly," *Power*, 75:555, 556, April 12, 1932.

Gives causes of noise in induction motors.

21. Editorial, "Safety Always," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 24:113, April, 1935.

Discusses safety from tool-storage standpoint, guarding of equipment, floors. Brief.

22. Editorial, "Showing the Need of Better Seeing," *Factory Management and Maintenance*, 92:97, 98, March, 1934.

Reports a study of lighting conditions in 1,907 industrial plants. The average intensity found was 2.85 foot-candles. Many other interesting figures are given.

23. Editorial, "Standards of School Lighting," *Transactions of Illuminating Engineering Society*, 28:36–43, January, 1933.

Gives several useful principles concerning schoolroom lighting in general.

24. Editorial, "Suggested Code for School Room Ventilation," *American School Board Journal*, November, 1930, 81:61, and 110–113.

Lists the fundamentals of good ventilation. Proposes a code as a model for states to follow in making laws.

25. Editorial, *Transactions of Illuminating Engineering Society*, 28:491, 1933.

26. Engelhardt, N. L., *Standards for Junior High School Buildings*, Teachers College, Columbia University, New York City, 1932, 161 p.

27. Engelhardt, N. L. and Engelhardt, F., *Planning School Building Programs*, Teachers College, Columbia University, New York City, 1930, 574 p.

Of value to the school administrator who is planning a new building.

28. Foulkes, Thomas R., "Correcting Faulty Illumination of a Drafting Room," *Industrial Education Magazine*, 27:324, 325, April, 1926.

How one instructor corrected faulty illumination. Of limited worth.

29. Frandsen, D. J., "Artificial Lighting of Schools," *Architectural Forum*, 48:459–462, March, 1928.

Discusses effects of poor lighting on children's eyes and justifies good artificial light as costing less than poor light because of increased class efficiency. Recommends 8 to 12 foot-candles in laboratories; 15 to 25 foot-candles in drawing rooms. Treats diffusion and glare, distribution of light, types of lighting fixtures, sizes of globes, and spacing of luminaires.

30. Gardner, Henry A., "Painting — The Other Half of Better Seeing," *Factory Management and Maintenance*, 92:103–105, March, 1934.

An article citing examples from industry to show the value of paint in helping to solve the problem of illumination. Gives a table of light reflecting values of various colored paints.

31. Hamon, R. L. and Standish, H. E., "General Shop for Rural Schools," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 24:49–54, February, 1935.

Gives many excellent ideas for planning a rural industrial-arts shop. Several layouts and a list of equipment are given.

32. Harrison, W. K. and Dobbin, C. E., *School Buildings Today and Tomorrow*, Architectural Book Publishing Company, New York City, 1931, 233 p.

33. Hibben, S. G., "Cost of Neglected Maintenance," *Electrical World*, 101:332–334, March 11, 1933.

An excellent article pointing out the losses which the American public pays because our artificial lighting systems are not taken care of. Gives facts and figures. Two graphs show increased efficiency of properly maintained lighting conditions.

34. Hibben, Samuel G., "How to Get Better Seeing," *Factory Management and Maintenance*, 92:99–102, March, 1934.

A good article. Gives a table showing how lamps increase in size. Several "don'ts" are given as precautions in using Mazda lamps.

35. Hopkinson, G. M., "Natural and Artificial Lighting of School Rooms," *American School Board Journal*, 81:41, 42, October, 1930.

Summarizes state laws in regard to ratio of window area to floor area. Advises no credit for glass area lower than 36 inches from the floor. Quotes the Ohio law on school lighting.

36. Hunter, W. L., "Principles of Shop Planning," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 23:38, 39, February, 1934.

Tentative statement of principles formulated by twenty experienced industrial-arts teachers in conference at Iowa State College.

37. Irons, G. E., "Guarding the Machinery in School Shops," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 16:106, 107, March, 1927. Also 16:155–157, April, 1927.

Sets forth the standards adopted by the board of education of Cleveland, Ohio, to insure buildings safely constructed, machinery properly guarded and safely controlled. Sets forth safety provisions specifically for each of the kinds of industrial-arts laboratories. Quite detailed.

38. Hall, George H., "Quiet Operation the Result of Proper Motor Installation," *Electric World*, 103:335–338, March, 1934.

Gives many practical suggestions for the installation of motors so as to reduce noise. Soundproof motor enclosures, silent belts, soundproof foundations, sound-isolating feet and noise-absorbing bases are discussed.

39. Knudsen, V. O., "Acoustical Problems in the Heating and Ventilating of Buildings," *Heating, Piping and Air Conditioning*, 3:1035–1040, December, 1931.

A fine article on the intensities of different kinds of noise. Ways on insulating walls. Of general interest only to industrial-arts teachers.

40. Kornhauser, A. W., "The Effects of Noise on Office Output," *Industrial Psychology*, 2:621, 622.

41. Kunerth, William, *A Textbook of Illumination*, John Wiley and Sons, New York City, 1936, 276 pp.

42. Logan, Henry L., "Lighting the Classroom more Effectively with Less Illumination," *Architectural Record*, 75:533, June, 1934.

Of but slight value.

43. Logan, H. L., "Lighting the Classroom," *Architectural Record*, 70:54, 55, July, 1931.

Gives a table of average daylight intensities in classrooms for east, west, north, and south exposures. A formula is given which enables one to determine minimum light intensity for winter months and at several distances from the windows.

44. Luckiesh, M., "Workers are Human Seeing-Machines," *Factory Management and Maintenance*, 92:94–96, March, 1934.

An excellent article. Reports a scientific study showing the reduction of nervous tension and muscular strain when lighting is adequate. Recommends as much as 1,000 foot-candles for some types of work.

45. Luckiesh, M. and Moss, Frank K., "The Applied Science of Seeing," *Transactions of Illuminating Engineering Society*, 28:842–865, 1933.

Maintains that the foot-candle method of recommending lighting intensity is inadequate. Lighting standards now thoroughly antiquated. A geometric scale, rather than an arithmetic, of light values should be used.

46. Luckiesh, M. and Moss, Frank K., "The New Science of Lighting," *Transactions of Illuminating Engineering Society*, 29:641–676, 1934.

Rather comprehensive. Suggests that instead of trying to have artificial lighting compete with darkness, we would endeavor to compete in terms of daylight.

47. Luckiesh, M. and Moss, Frank K., "Recommended Foot-candles," *Transactions of Illuminating Engineering Society*, 26:1061–1098, 1931.

Recommends proper intensities for various kinds of tasks. Seemingly rather ideal.

48. Luckiesh, M. and Moss, Frank K., "Quality in Lighting," *Transactions of Illuminating Engineering Society*, 30:531–562, 1935.

Supplements the previous articles by the same authors.

49. McStay, H., "Accommodating the Larger Class," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 25:45–48, February, 1936.

Tells of changes in laboratory layout which were made in order to accommodate larger classes. Shows tool cabinets and demonstration area. Photographs.

50. Perkins, Dwight H., "Special Rooms in High Schools," *Architectural Forum*, 48:425–432, March, 1928.

Discusses the planning of laboratories, girls' shops, sewing rooms, woodshop, auto shop, electric shop, printshop, sheet metal, locker rooms, mechanical drawing, art rooms, library, study hall, and offices.

51. Poor, E. J., "What the States Require in Industrial Lighting," *Electrical World*, 104:135, 136, August, 1934.

Points out the inadequate lighting in industrial plants in the several states. Argues that captains of industry must first be educated to the benefits of good lighting before conditions will be greatly improved.

52. Resides, G. H., "Equipment for Teaching Woodwork on a Production Basis," *Industrial Education*, 34:190–192, June, 1933.

Describes layout of shop equipment and organization for production woodworking.

53. Ross, Nelson C., "Lighting and Electrical Systems for School Buildings," *Architectural Forum*, 55:743–752, December, 1931.

Discusses the technical phases of wiring, conduits, transformers, switchboards, power and radio circuits for schools. Has a section pertaining to "industrial shops." Lists the outlets and electrical service for which the architect usually makes provision.

54. Ruden, W. L., "Getting Rid of Smoke," *Industrial Education*, 31:324, 325, February, 1930.

Describes a system of overhead sheet-metal piping with a blower system for removing smoke in a forge shop.

55. Ryder, Carleton B., "The Neglected Sense," *Architecture*, 66:319–324, December, 1932.

Discusses the psychology of acoustics. Gives a table of relative intensity of various typical sounds. Gives a table of coefficients of absorption of various home furnishings.

56. Slingluff, B. F., "Supplies and Equipment for Industrial Arts Education in Philadelphia," *Industrial Education Magazine*, 27:316–318, April, 1926.

Discusses standardized terminology for equipment and supplies, selection of equipment, quantity of equipment, and warehouse storage. Of greater interest to those in large cities.

57. Sturrock, W., "The School Shop Lighting Problem," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 22:45–50, February, 1933.

A fairly good article. Recommends 12 to 15 foot-candles for shops and 18 to 25 foot-candles for drafting rooms.

58. Strayer, G. D. and Engelhardt, N. L., *Standards for Elementary School Buildings*. Teachers College, Columbia University, New York City, 1933, 181 p.

59. Tearney, O. A., "A Study of School Shops for the Junior High School," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 22:73–75, March, 1932.

A summary of a master's thesis. Gives location of 141 shops with reference to the school building, natural lighting exposure, ratio of glass area to floor area, square footage of floor area per pupil, and auxiliary rooms.

60. Van Westrienen, H. J., "Planning a School-Building Program," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 20:159–165, May, 1931.

Discussion of preliminary steps beginning with a philosophy of education. Caring for plans and specifications, including checking up on the architect. Many practical suggestions encountered by the author in new building programs. Very good.

61. Warner, William E., "Establishing the General Shop," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 19:287–290, August, 1930. Also 19: 344–346, September 1930. Also 19:374–376, October, 1930. Also 19:420–425, November, 1930.

Of great value to the person who intends to plan a general shop.

62. Warner, William E., "Studies in School Shop Planning," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 23:31–38, February, 1934.

Discusses shop location, size and shape of shop, units to be included, auxiliary facilities, equipment provisions, building details, service features, lighting, noise. An excellent article.

63. Zahour, R. L., "Good Illumination in the School Room," *American School Board Journal*, 82:69, 70, January, 1931.

A short article but has pertinent ideas concisely stated. Speaks of classroom illumination, special rooms, gymnasium and shop lighting. Stresses importance of proper maintenance if the lighting system is to be kept up to maximum efficiency.

School Production for the Market

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How labor and industry co-operate in helping the vocational school to do effective work.

"Don't labor and industry object to your sale of school production?" is a question the administrators of the La Crosse Vocational and Adult Schools are commonly called upon to answer. It is true, the La Crosse school uses the production method of training and then markets its product for cash. There is something decidedly unique about this method. At any rate, visitors to our school commonly inquire, "What does labor say to your making and selling one hundred tables?" "You compete with local automobile dealers in the repair of cars. Don't these dealers object to the school doing such work?"

In La Crosse, labor and industry cooperate wholeheartedly with the Vocational and Adult Schools. The heads of labor unions and presidents of the largest

industrial concerns in the city have sat upon the board of vocational and adult education and sanctioned the production method of training. Common arguments directed against the method are, "It is dangerous." "Aren't you afraid to do it?" "Labor and industry won't permit it." Of course, there will be objections, and we must admit that objections have been voiced in our town. But the plan is essentially right and highly efficient for all concerned — the school, labor, industry, the trainee, and the general public. For that reason, one needs but to have faith that right will prevail, and in that faith work judiciously, tactfully, and continuously toward efficient education through the production method.

We shall not here concern ourselves with a defense or eulogy of the production method. Some of its outstanding merits, however, will be indirectly treated throughout this article. We hope here to answer the questions, "Can it be done? Are you permitted to use the production method and market the school's production?"

During the past year we had an eighteen-year-old boy doing reasonably good work in welding. At that time we were running a production job consisting of 36 high stools welded up of ½-in. pipe. The tops were round and were turned in the woodworking shop. This eighteen-year-old boy assisted in supervising the less skilled trainees in welding. We made no effort to conceal the work. On the contrary, we showed an employer through the shop and specifically pointed out this production job and explained its merits. Did this employer object? No. He hired the boy and two days later hired another boy to serve as a helper to the first one. That ended production in the school welding shop for some time, or at least until more boys were trained to the point of employability. The employer appreciated securing this welder. It certainly saved him a lot to have the school prepare the chap and turn him over to him as a gift.

The boy's father visited the school on several occasions during the boy's training period. He was a member of the labor union and anxious to get his boy established in a trade. This father, by the way, is ready to defend the school in the event its production methods are attacked on the union floor.

Practical Work for the Plumber Apprentices

Two years ago, we installed several sinks and drinking fountains in various classrooms and shops. We turned this installation job over to our plumber-apprentice instructor who in turn placed the problem before his plumbers' apprenticeship class. These apprentices are regularly indentured in the plumbing trade, attend the Vocational and Adult Schools four hours per week in the day time, and receive pay from their employer for school attendance. The class got the plans of the school building and each apprentice worked out a plan of installation. These plans were not alike, yet each apprentice was prone to defend his own plan of installation, it being the creation of his own mind. It is interesting to note that a week later the employer of the apprentice whose plan had been selected, was boasting about this fact. The class instructor is a licensed journeyman plumber and a member of the union, and he is closely associated with officials of the Wisconsin American Federation of Labor.

It is the policy of our school to establish evening-school centers in various parts of the city so that adults may better have access to evening adult education. We received a call from a group of women living in the south end of town, asking for the establishment of a class in cosmetic arts at the Webster Center. The Webster Center classes are held in a grade-school building of the type with few facilities for a cosmetic-arts class. The co-ordinator of the Vocational and Adult Schools immediately contacted the manager of the largest commercial beauty parlor in the city to get information and assistance toward establishing a cosmetic-arts class at the Webster Center. The establishment of that class meant that 24 women would be trained in the use of facials, hairdressing, manicures, and the like. They would be taught how to take care of this work for themselves and their families. Apparently, it would save them considerable expense for beauty-parlor work. One could assume that it would mean a loss of business to the beauty-parlor operators. However, the manager of the largest beauty parlor gladly accompanied the co-ordinator to the Webster Center where they found that the building possessed a small kitchen equipped with a sink, water faucets, and a gas oven. The manager explained how this equipment could be adapted for use, and how, with the addition of a few other pieces, it would take care of a class of ten or twelve women. She then loaned the school an extra shampoo board she had on hand, and also assisted in securing a competent operator as an instructor.

The establishment of contact in the foregoing case was not quite so sudden. It had been built up. In previous years, cooperation from the trade had been secured by the administration in the establishment of its first cosmetic-arts department and beauty parlor in the main building of the school. The trade did not consider the school a competitor. In fact, they realized that it was helping to elevate the general standard for the use of cosmetology in the city and that, both directly and indirectly, it was reacting favorably to their business.

During the evening-school year, we usually have from 16 to 24 evening adult dressmaking classes. Hundreds upon hundreds of local women have learned to make garments for their own families. Do the retail stores object on the grounds that this training cuts down business in the sale of ready-made clothes? Decidedly not. Merchants co-operate and grant the school a discount on supplies purchased for its clothing department. Why should they object? The school is increasing the wealth of goods and purchasing power in the hands of local store patrons. If the stores do not sell ready-made clothes, they will sell much more of yard goods, trimmings, and other mechandise. But one may say, "There are the stores that sell only ready-to wear." Our answer to that is that our ready-to-wear stores pay a high auditorium rental and co-operate with the annual style show held at the Vocational and Adult Schools. Practically every ready-to-wear store calls on the school for boys to work part time as window washers and porters, while they work their way through school. They employ seamstresses to do their work in altering and fitting of garments. Many of these seamstresses serve also as teachers at the Vocational and Adult Evening Schools. We hold an annual exhibit of school products. Local merchants are glad to co-operate with the school in making a success of these exhibits. Last winter, 250 salespeople from the local stores received instruction in salesmanship at the Vocational and Adult Schools, for 2 hours each week. The school trains vast numbers of bookkeepers, stenographers, and secretaries, which the local stores absorb as employees. While the store manager may be calling the Vocational and Adult Schools for a secretary, his wife may be at the school asking for a maid, and before the end of the week his son may be asking to get some tickets printed at the school printshop for the benefit of the Boy Scout banquet.

A Production Job for the Woodworking Shop

It is rather common for our woodworking shop to manufacture and market 50 woodworking benches, 100 typewriter tables, 200 footstools, and various other furniture or equipment. Ninety-four woodworking vises were built and marketed by our general metal shop last year. The printshop sold $2,412 worth of printing. None of these shops is limited, however, to a few type production jobs. The production of the general metal shop, involv-

ing over a 100 items, includes everything from one special dustpan to 94 woodworking vises. The other shops have approximately the same type of production record.

The auto-mechanics department of the La Crosse Vocational and Adult Schools repaired as many automobiles during the past five years as any dealer's garage in town. The school entertains a very fine relationship with local garages and local car dealers. The instructor of auto mechanics is a welcome visitor in any garage. In fact, when he needs a special tool with which to work on a Buick, Chevrolet, Dodge, or other car, he goes to the respective dealer to borrow the tool. The instructor is invited to the various meetings and parties put on by the dealers and service stations. He is a tradesman and mechanic of high rank, and maintains the trade respect of the automotive field.

The automobile shop is open to adult students four nights a week. Part-time teachers are necessary to carry on some of this work, and foreman mechanics from leading service garages are employed to give instruction at the Vocational and Adult Evening Schools. The first motor analyzer that came to La Crosse was installed at the Vocational and Adult School. Later, as local garages installed these machines, they sent their men to the school to receive instruction on the use of the analyzer, or called for the instructor to come to their shops to teach their men on the job. Automobile dealers, on the whole, recognize the prestige of the schools' auto-mechanics instructor. They are aware of the fact that any number of local citizens talk over their transportation problems with the instructor before making a selection of a car.

Instructors Obtained from Industry

In September, we opened a new course in drafting and hired for this purpose, a college graduate with three years of experience as a draftsman with the Trane Company, a local concern. It meant the loss of a good man to the Trane Company, but they were glad to co-operate. They have, in fact, sent an increasing number of their employees to the evening school to receive instruction in blueprint reading. The large number of men who enrolled made it necessary to employ an additional part-time instructor for blueprint reading. In direct line with the schools' policy of employing competent tradesmen to teach trades subjects, the man selected for part-time teaching was a designer and, incidentally, he happened to be in the employ of the Trane Company.

The good will accorded the La Crosse Vocational and Adult Schools was not an overnight creation — it was a long-time development and outgrowth of a continuous effort to pursue the most efficient methods of instruction and administration in an effort to give the best possible service to the entire community for the least expenditure by the community. The happy relationship that exists at La Crosse, as depicted in the foregoing paragraphs, shows how completely the life of the community and the life of the school interweave. The school is not cloistered within brick walls. Its activities cannot be contained in or confined to a single building. It uses facilities throughout the entire city, and the entire city uses the school's facilities. People are much at home at the school. Local groups seeking to secure large and desirable audiences for style shows, safety exhibits, or other local projects find the Vocational and Adult Schools the best center at which to secure results. This is true, because the Vocational and Adult Schools have become the civic and educational center for the adult population of La Crosse.

Communities where the situation is still to be developed may do well to proceed slowly. They must prove themselves step by step. They would really find it a hectic undertaking to plunge headlong into the type of venture common in La Crosse. It takes time for a people and a school to become absorbed in each other, but if the school has the right policy and efficiency for the good of the community, it need not hesitate to build consistently and constructively along right lines. It will meet objections. It will meet some criticism, all of which makes it doubly important that the school's policy is founded on the plan that is essentially right so that the objections to new departures may be met from time to time, and so that criticism may be changed to applause.

There are a few general plans that are basic in achieving a high rating with labor, industry, and the facilities in general in a community. One of the first advantages that can come to a vocational school is a representative board of vocational education. In La Crosse and throughout Wisconsin, for that matter, the board of vocational and adult education in the local community is a board distinctly separate from the city board of education. Whereas the city board of education administers the policies for city grade and high schools, the board of vocational and adult education governs the policies of the vocational and adult schools. This is a five-man board made up of two employer representatives, two employee representatives, and the city superintendent of schools. This setup gives the director of vocational and adult education a board representing labor, industry, and education. For the past ten years, the trades and labor organizer of the local federation of labor has been a member of the board of vocational and adult education. The president of the largest industry in the city, employing 1,800 persons, is now president of the board. Two representatives are always typically employer representatives and two are employee representatives. The trades and labor organizer of the local American Federation of Labor, at one time a member of the city board of education, objected to the city schools' industrial-arts shops producing furniture or other materials for the use of the schools. He contended that this production should be scrapped, and that the schools should purchase the fruits of labor through the regular channels. This same man, now for a number of years a member of the board of vocational and adult education, has become an enthusiast for the production method and takes a lead in insisting upon the purchase of equipment that will enable the school shops to produce like a factory. He insists that the only way to learn trade and industry is to practice it. Board members are responsible to the community for the policies of the school. They must understand the school's policy and philosophy and stand ready to defend them. For good results, they must also know and understand the community, and should be representative of employer and employee where these two groups are vitally affected.

Closely akin to the board of vocational education are the advisory committees representing individual trades. For example, an advisory committee for the plumbing trade has governed apprenticeship in the plumbing trade in La Crosse for many years. It has been represented by two master plumbers, two journeyman plumbers, and the co-ordinator of the Vocational and Adult Schools. These men have first-hand knowledge of conditions in the trade and the needs of the trade. They approve every prospective apprenticeship before it goes into force, and they supervise school attendance and all apprenticeship rules. Apprentices are required to attend day school and journeymen and masters are urged to attend a short session of evening school each year.

Industrial Advisory Committees

Anyone not familiar with the use of advisory committees in trade and industries should thoroughly inform himself as to the objective, plan, procedure, and technique involved. It is necessary that the representatives on this committee, from the very start, have the right idea and attitude in regard to the function they are to perform. Since the school is apt to be taking the initiative in the venture, it is necessarily responsible for the proper functioning of the committee. The schoolman who carries this out with the proper

degree of preparation is doing something to imbed the school in a certain faction of the community. Advisory-committee members may battle with one another, with the members of their trade, with masters, with journeymen, and with apprentices. They may have their differences with the state board of health, local trade ordinances, and other forces that beset their path. They will have no battle with the school. They are close enough to this institution to know and recognize the school as their friend and ally that needs their help in its efforts to improve the standard of their trade through a better training setup.

Trades instructors of high character and craftsmanship are another asset to good standing of a vocational school. It is necessary to secure as instructors the best possible tradesmen available and then to develop them into good teachers of their trade. Instructors of that type will attract the trade and industrial men of the community. Journeymen and masters will not hesitate to take instruction from fellow tradesmen whom they respect for superiority of craftsmanship, and instructional ability. The trades teacher who has served his apprenticeship in a well-going local industry and has proved his ability through a number of years of success as a journeyman, is in a position to talk and mingle with tradesmen in a spirit of equality.

Instructors and Out-of-School Activities

Incidentally, these instructors of trades and industries must be professional community factors indeed. The school administration can effectively cover a part of the community life of a city. The instructional staff can be of special value also in its activities in social and civic organizations, in churches, and in lodges. The administration and the instructional staff of the La Crosse Vocational and Adult Schools covers practically everything from the Chamber of Commerce to the two-man cribbage club. Some of them are Sunday-school superintendents and all of them are leaders of youth. The men teachers show a high degree of activity in organizations like the American Legion and Kiwanis Club. The women teachers are active members in the University and College Women's Club, the Young Women's Christian Association, and the club that distributes baskets to the poor.

Many objections disappear or never come into being because they have met the school personnel. The school teachers rub elbows with their fellow men in every walk of life and become well acquainted with them. The effect of such associations is not intended to answer disapproval of school procedure. It does more than that. It keeps criticism from arising by building up a vast array of wholesome approval.

The factory sweeper who comes humbly to the school doors to talk about the problems of his boy can be treated with such sincere man-to-man consideration that he will remember it for life. If he does not go back to his factory the next day and tell about it, one can rest assured that the school has passed up a matter of importance. It is well, therefore, in selecting and training a staff of vocational-school instructors to bear in mind the description of the man as made by Kipling: "If you can talk with crowds and keep your virtue, or walk with kings and yet not lose the common touch."

We thus far have mentioned two factors highly important in a school's achievement in a community: One, the board and advisory committees representing the employer, the employee, and education; the other, the tradesmen instructor who holds a high rank in his trade, socially, and professionally. The third important factor is administration. A good board and a good staff may not achieve without intelligent and tactful administration. It is the function of the administrator so to direct, manipulate, and manage the situation for each individual person and each individual situation, that good will may always be gained but never lost.

No one in La Crosse really seems to feel any competition from the Vocational and Adult School. There may be times when an unemployed man, disgruntled, may contend on the floor of the labor union that the school is participating in unfair practice. We venture to say that this union man will receive his answer from the four corners of the union floor. This answer might be stated as follows: "If you attend the Vocational and Adult Schools and learn something you will undoubtedly get a job."

When our school wanted to start a chair-seat caning course for a group of mentally retarded boys, it was face to face with the fact that this work was done by local furniture dealers, who raised objections. The school director, therefore, contacted the local furniture dealers, whose principal business is selling furniture, and explained to them that it costs a lot of money for a patron of theirs to get an old chair recaned because of the high price of cane and the high price of labor. He asked them if it wasn't true that their customers were usually displeased if not completely angered when they paid their bill for recaning and refinishing an old chair. This fact was very apparent to the furniture dealers, and realizing that the total volume of this business was to them insignificant, and perhaps really a detriment, they decided to turn this job over to the Vocational and Adult Schools. Local furniture dealers are still doing some of this work but for the most part, refer their customers to the school for caning chairs. Without the proper action on the part of the administration in this case, the instructional work might have been lost and permanent ill will created.

Selling School Products Through Local Stores

The school does not sell in competition with the local hardware stores — it sells through them. For various products it is our policy to sell through dealers only, and patrons are referred to local dealers to purchase our products. In a few instances, these dealers are out-of-town concerns whose sales would not, in anywise, compete with anyone in the local community.

Selling price should be given much thought. Whereas we repair automobiles, and the customer must pay for the parts that have gone into the repair of his car, the administration never permits the sale of these parts except at local retail prices. The administration must remember that it is not competition that businessmen fear for, in fact, competition is the life of business. They do fear and they do object to unfair competition. We are face to face with this situation in our school automobile shop and we cannot permit patrons to secure services at the school at unfair prices. The situation changes from shop to shop and product to product, and it is decidedly an administrative function to manage to avoid all unfair practice.

The Vocational and Adult Schools made an agreement with the local printing trade, whereby the school confines itself to printing only for churches, charities, and community organizations such as the Boy Scouts. This printing, together with the printing for the schools, gives the printshop all the work it can possibly use for training purposes. Though the churches and charities pay for the printing they receive, it is never a price as high as that charged by commercial shops. The local printers are glad to have this type of work off their hands. They are usually expected to print for churches and charities for little or nothing and are glad to refer this work to the school for training purpose. The Vocational and Adult Schools printshop runs a small class of about twelve persons and sold over $2,400 worth of printing last year. It is indefensible to think that this production should be scrapped. From the sheer standpoint of economics alone, it is indefensible, to say nothing about its training value. The stand taken by the school in relation to its printshop and the local printing trade has maintained the happiest relationship all around. The school gains more production work

than it can possibly handle and is in no competition with the local trade. Besides that, the printshop shows a profit on the supplies it consumes.

In any city, the local fire department, health department, Y. M. C. A., city hospital, sanatorium, or other institution is always in need of some equipment which is never secured and never purchased through regular channels. These organizations provide a wealth of opportunity for the school. If the school will make five or six desks for the nurses at the local health department and charge only the cost of actual materials, plus a little for overhead, it will gain much good will from the local health department. It will compete with no one, and the taxing authorities will be pleased to have the situation off their hands. The school receives full pay for all supplies involved, and has enjoyed the opportunity to secure production work.

It must be remembered that the schools' policy is to get production work and not necessarily to engage in an industrial enterprise. The school is merely seeking to secure the most efficient training setup at the most economical price to the community. Whenever it loses sight of that fact and seeks to engage in production for profit, it is on the verge of engaging in exploitation of the child or some element of the community. The training objective must, therefore, be ever foremost in the mind of the administrator.

Securing Good Will for the School

The school administrator is ever in need of public good will, and he realizes that fact most keenly. He must, however, in his anxiety over rubbing someone's fur the wrong way, not become weak in his community and school, and prostrate himself before every objecting faction. It must be remembered that the school in itself is a large institution. It has considerable personnel and standing in a community. It may have bargaining power equal to that of any one trade or industry. Objections to school methods, after all, come largely from disgruntled individuals. The broad-minded men of caliber are not so ready to see things wrong. Possibly some business in town does yield a minor point but usually this is in exchange for some large measure of good will or prestige. Business and labor need good will, as well as does the school, and will not sacrifice their standing in a community over some matter of trivial importance. Trade unions and labor organizations have made great sacrifices to gain advantages. They are not necessarily seeking a battle with the community on every front. They are quick to sense that the school is one of their good friends and not a competitor. The school may well take a firm stand in favor of good production training and fearlessly face labor officials on this issue and win the respect of labor. In La Crosse, labor has always been strongly organized, and has always accorded the Vocational and Adult Schools the highest respect and co-operation.

A bit of caution, however, is of value to the administrator seeking to build up the efficiency of his training. The project method is weak, it is difficult to sell, and the administrator who has used nothing better stands weakly in the presence of trade and industrial attack. On the other hand, the more he increases efficiency through production, the more avenues of production open before him.

Production should be a school's big selling feature. It must, however, be handled and displayed so as always to sell and never to unsell. In other words, it is entirely unnecessary to wave a red cloth in a bull's face. If you're trying to soothe the bull's feelings, it is a simple matter to pick out the right color of cloth. Production, likewise possesses such an abundance of possibilities, that there is no need in selecting marketable production that is grossly displeasing to a single citizen. Never be heedless in interfering with a pet idea, hobby, or business of anyone. It may be good judicious business to sell repairwork to an industry and not do repairwork in competition with that industry. If some industry in your town makes refrigerators, the woodworking shop in your school can well turn to some other production such as office desks. There might even be an opportunity to enlist the co-operation of the refrigerator-making industry, whereby workers will be trained for that industry in the methods of production it pursues. The administrator can work gradually and gain opportunities one after another all along the line in building a production setup. He need not change over in a day. The Vocational and Adult Schools in La Crosse have been organized for 25 years. A large number of union, industrial, office, and business workers today are persons who received instruction, if not their first chance at economic life, at the Vocational and Adult Schools.

After all, it is the administration and not the production method that can be defeated. Many arguments can be made by labor, industry, the public, and the trainee in behalf of a vocational setup that will produce. The administrator must have the arguments and defenses for his methods in mind and spread the gospel regarding them. As he does so, he will find that his objectives and his measures are basically sound and, though they may be subject to attack, they will stand the test.

As Labor Views It

Following are some arguments that are made by labor in support of an efficient production vocational-training method:

1. Boys must learn trade or occupation somehow. If they learn at school, they do not participate in the type of destructive competition involved when they learn from an employer.

2. The school keeps boys out of industry and industrial competition. It keeps them in school longer and so reduces child labor and the competition of child labor.

3. The boy who is trained for work and in training for an occupation is not participating in cheap, unfair labor. The product of the boy in school is much more fair than the product of the boy in employment.

4. We need high-caliber trained tradesmen, and only the school can train boys to produce on a job by doing production work and following industrial production methods.

5. The school co-operates with us in training apprentices, and they are never interested in training more apprentices than the trade can absorb.

6. Many of us have sons who desire to take training in some form of mechanical endeavor. They need an efficient production-method school in which to secure that training.

7. Our journeymen need the extension training offered by the school. Only a school that understands trade and industry can effectively give such training.

8. We have representation of labor on the board of vocational education and on the trade advisory committees. This setup prevents abuses from creeping in.

9. The production method reduces the cost of training and so makes it more readily available to us and to our families.

10. School production on the whole amounts to but little in the sum total production of any trade or city. It is hard to see where anyone might secure an additional day's work if the school ceased using this method.

11. The school helps many laborers secure employment and promotion. It prepares young men for their first jobs. The school assists us in maintaining trade and occupational standards and in raising them to a higher level.

12. The maintenance of the school decreases competition. Every time the school employs a tradesman as an instructor, it has withdrawn him from the field of production and competition. If the school were closed and the highly competent instructors were turned out to seek other fields of employment, it would mean serious competition. These men are competent journeymen. They have the ability of masters. Relieved of their training jobs, they would be free to produce more in competitive industry than their classes of boys in training can now produce as learners in school.

13. The school does not flood the trades with half-trained mechanics. It helps us in regulating the influx into the trade.

As the Employer Sees It

1. The schools do not compete. They are

trying to do a good training job. The few products they sell are negligible insofar as industry is concerned and it saves the taxpayers money.

2. Industry needs trained help and skilled workers. Training these workers in the industry is a big expense to production and is inefficient in the outcome. The school can do the better training job.

3. It is apparent that the more the school follows industrial methods of production, the more efficient will be its training output. If we are to use the school trainees, we want them trained in our methods of production.

4. We have always found the school decidedly anxious to avoid unfair competition and to co-operate with industry in every way.

5. Employers are represented on the school board and on the advisory boards. This is a very fair setup and is helpful to both the school and to industry.

6. Large numbers of our workers are attending evening school, and we heartily recommend it.

7. The school employs a considerable number of the best industrial men to teach part time in the evening schools. This fact gives every assurance that the training meets industrial standards.

8. We recommend vocational-school attendance to the unemployed.

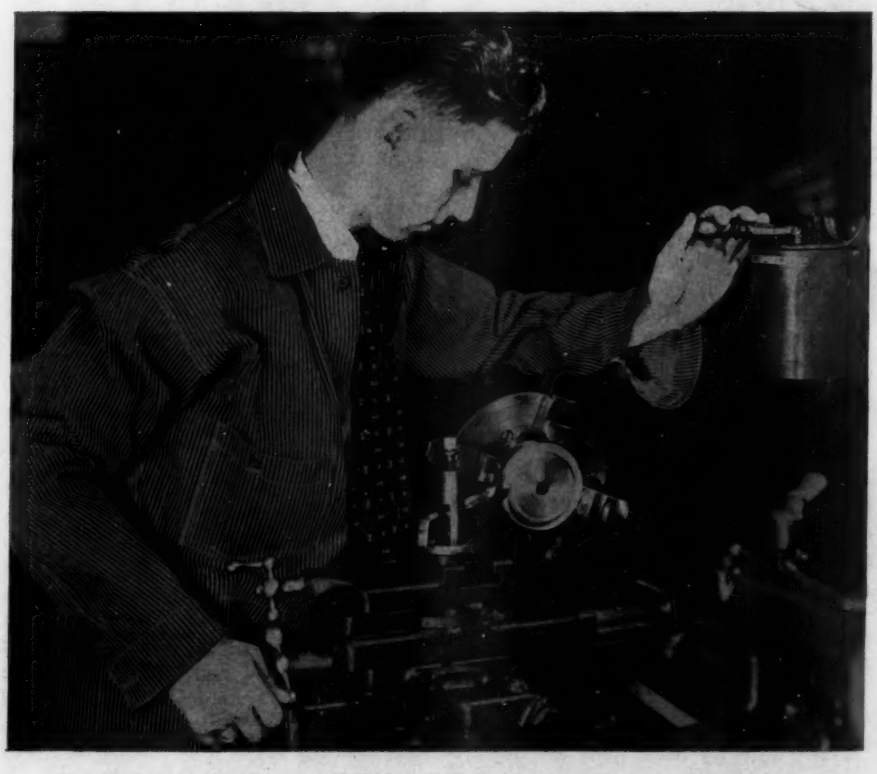
A primary argument in favor of the production method made by the public is, of course, the argument of cost. The production method saves the taxpayer money, it saves the student money, and it assists in financing the work of the school. To produce useful merchandise and destroy it to eliminate competition is, of course, indefensible waste. To produce materials which cannot be marketed is also sheer waste and teaches inefficiency. It is a misuse of the student's time to permit him to consume his efforts on production that has no value, no advantage, and no ultimate objective.

The community has much invested in the school. It turns a vast amount of property, including buildings and equipment, over to the school authorities to operate for efficient education. In carrying out their stewardship, the school authorities cannot sacrifice efficient instruction to suit the whims of any group or clique. The local citizenship has a right to expect useful training. If this is to be training that fits for useful employment, it can only be efficiently conducted through the use of regular standards of speed, quality, and production of the type used in industry.

There is an argument for the production method to be made by the school on behalf of the school child. Too often this argument is slighted. The project and laboratory method of vocational education is a more flagrant exploitation of the child than the production method has ever been. An effort to train for an occupation in trade and industry by some nonproduction method is sheer betrayal of the child who has placed his confidence in the school, assuming that it will provide him with proper occupational training. By any other method, the boy in the industrial school shop is too apt to learn bad habits — habits that will take industry a long time to overcome. A boy who spends his time learning the principles of close-fitting valve surfaces on an automobile engine, and assembles and disassembles an engine to see how it looks, and never learns to grind and fit these surfaces, is not acquiring any skill that he can place on the market; neither is he receiving any real appreciation of the art of automobile mechanics. On the other hand, when the boy learns to fit these valve surfaces with his own hands with skillful use of tools, so that when the engine is assembled it is worth more than it was worth before, it is then that the boy has acquired growth, training, education, and he feels a sense of power, confidence, employability, and mastery. He has become a more useful element in society, to society, and to himself. He has acquired a full appreciation of the art and the skill and the technique involved — something deeper than a stock of information. He has received a development that no man can take from him. He is able, in a measure, to answer that question flung at youth everywhere today: "What can you do?" The automobile engine valve he has ground must be assembled and the car must go out on the road and perform. The operation of that engine is the real testimony to the education the boy has acquired. It is his real diploma and it will help him in getting the economic needs of his life. He has reached the point where employment is close to his door.

A distinct training advantage of the production method is that it makes supplies always and continuously available. Briefly speaking, the administration does not care how many supplies are requisitioned for a school shop. Instructors at the La Crosse Vocational and Adult Schools are in a position to buy practically any material, metal, lumber, hinges, parts, and the like, at any time. The more supplies a shop uses, the more income is brought into the shop. Every shop shows a balance in its favor on the use of supplies. In other words, supplies cost the school nothing. They are charged to the production jobs. As yet, no other method has been found that so adequately and so unhesitatingly provides for shop supplies.

We shall say in summary, that the production method, without a market for products, is out of question, and the adequate training of a boy for trade and industrial occupation, except by the production method, is impossible. The boy is an instrument, not a receptacle.



Dangerous practices on the lathe. O. P. Schneider, shop superintendent, West Technical High School, Cleveland, Ohio

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

Guidance and the Industrial-Arts Teacher

It seems almost preposterous to suggest that the industrial-arts teacher should embrace another school activity. He is usually occupied throughout the full teaching day. His periods are short as it is, yet in many places they are being shortened still more. He is expected to develop in his students a modicum of skill, transmit to them considerable amounts of related and technical matter, develop proper habits and attitudes, do his own maintenance work, make the scenery required for plays and operettas, plan programs for the assembly, take care of a club or two, or act as the athletic coach. It seems that these activities would be sufficient to keep one man busy. Yet, there is a problem to be met, and the industrial-arts teacher seems to be the best man on the faculty for it.

The student in the secondary school is approaching the time when he must decide what he is to do for the future. He is confronted by the stupendous task of choosing one of 20,000 or more possible wage-earning jobs. He needs help.

The home has long ago passed the job of education, and with it the various types of guidance, to the schools. In the school itself, the industrial-arts teacher stands out as the logical person for doing vocational-guidance work. It is he who instructs in the practical phases of what adults do in earning a livelihood. He is intimately acquainted with the materials and processes used by the workers in industry. He is in practically continuous contact with business and industry in one way or another. Besides this, he is in close and intimate contact with his students. It is not strange, then, that the school should look upon the industrial-arts teacher as the one best fitted to help the student to adjust himself vocationally.

Industrial-arts teachers, then, must devise ways and means of assuming this added burden. It is encouraging to note that the number of books on this subject is continually increasing. The industrial-arts teacher can at least turn to these sources for aid. Guidance dipped out of books is not enough, however. It is better to supplement the material obtained from the books by making actual contacts. This may be done through well-conducted shop trips provided that the boys are prepared to get the greatest good out of such an excursion into business or industry. They must be guided to look for answers to such questions as: How many hours per day and per week must the worker put in on the job? What does he earn? Is the work difficult to learn? Does it require great strength? How does it affect one's health? What must the worker know, and what must he be able to do? Where can one learn the trade? How is the trade entered? Is the work steady? Is the occupation about to be replaced? What opportunities for advancement does it offer? What opportunity has the older worker of staying on the job?

Requiring the student to dig out these answers himself, will help him acquire much first-hand information on the industry which he is studying, and may help him to arrive at some definite conclusion as to his future life's work.

He may be further assisted by assignments which will require him to study governmental, state, and trade reports on conditions in the trades or occupations in which he is interested. Then, too, interviews may be arranged for him with employers and workers. Or letters may be written to some keymen in business or industry. Care should be taken, however, that this is not overdone, and that these letters do not take on the form of the usual questionnaire.

The industrial-arts teacher must recognize at the outset, that vocational guidance, rightly applied, is very broad because it naturally leads into educational guidance, health guidance, leisure guidance, personality guidance, and other ramifications of a guidance nature.

While the foregoing outlines fairly well just what must be done, and how the industrial-arts teacher may proceed to help his students in the arduous task of adjusting themselves occupationally, nevertheless, much is left to the instructor in determining his method of procedure. Naturally, some will do a better job of their guidance work than others, but the fine job done by the industrial-arts teachers the country over, in upgrading their own work gives assurance that they will also do a good job if they apply themselves wholeheartedly to the solution of the difficult problem of assisting youth to adjust itself occupationally.

Last-Minute Observations

The closing day of the school year is again approaching. Testing, grading, finishing up on projects, and assigning fill-in jobs to the students who have already finished the year's assignments take up much of the teacher's time. There are other things, however, which also need attention, and it is to remind the teacher of these that the following check list is herewith presented.

What new provisions must be made for the coming year? Is the class size going to be changed for the coming year? Are new activities to be added to those already offered?

Must new equipment be ordered and installed? Does the old equipment require overhauling or repair? Is the present arrangement of the equipment satisfactory or should it be changed?

Are the small tools in good condition? How many must be reconditioned? Have arrangements been made to have this work done? How many new ones must be ordered? Is the method of taking care of them during the school year satisfactory? Would it be better to devise a new method?

Has the method for housing the students' work been entirely satisfactory, or would changing it make for greater efficiency? Have the supply racks and shelves proved adequate? Have parts subject to rusting been protected?

Has the inventory been brought up to date? Has the forwarding address been left at the proper place? Have the keys been delivered to the proper person? The making out of an inventory and the returning of the keys are of special importance to any teacher who is about to change positions. By paying strict attention to these two items, much suspicion and ill will can be avoided.

While the foregoing list may not be as inclusive as it might be made, nevertheless, it will represent a starting point which will fill the closing days of the school year with as much worth-while activity as the busy industrial-arts or vocational-education instructor has put in on his job during the rest of the year.

New Deal Science in the Trade School

John S. Lear

Clifford B. Connelley
Vocational High School,
Pittsburgh, Pennsylvania

Making science function in shop-work.

The Old Idea

Time: 1920–1925.

Place: A typical trade school of the period — revamped from any old available school building.

Scene: A science department in charge of one or two instructors, one lecture room with demonstration table, banked seats and several apparatus cupboards. Sometimes, a classroom with several cupboards, a demonstration table, and tablet-arm chairs.

Program: To teach scientific facts relating to about a dozen different trades to four or five trade groups at the same time appearing in a class of twenty-five or thirty students of high-school age who were scheduled for class on a grade basis, i.e., 9B, 10A, 11A, etc. These grade groups reported for science on the half-day-about plan, i.e., morning, in shop and afternoon divided between Science, Mathematics, English, etc.

Procedure: Bearing in mind that with the equipment available, no student would be able to perform any experimental work himself and yet not wishing the course to consist entirely of so-called "paper work," the instructors proceeded to pick the most interesting and pertinent facts and experiments from the regular high-school courses in physics and chemistry and arranged them according to grade levels from 9B to 12A inclusive, as follows:

9B General Science and Measurements
9A Mechanics of Solids
10B Mechanics of Liquids
10A Mechanics of Gases
11B Electricity
11A Strength of Materials
12B Elementary Chemistry
12A Chemistry of Industrial Materials

Each student was required to write up in his notebook, the following: *Title, object, sketches, explanation* (as explained to him during the demonstration), *results* (as demonstrated), and *problems.*

After each experiment was completed a test was given and the notebooks were graded by the instructors individually before each student according to work accomplished, neatness, and test mark.

About one experiment per school month or ten per school year were required in order to pass the grade.

Strip film pictures and slides were shown at intervals to supplement the work and demonstrations.

This sets forth the old idea of what was done in science — call it related, shop, or trade science or what you will — but pity the poor instructor whose job it was to hold the interest of the boy, let alone relate the science to his trade and especially pity him when you consider that during this period the trade schools were the "dumping ground" for the high schools. Whether we like to admit it or not, the fact remains that most problem cases which arose among boys in the high schools were sooner or later recommended to the trade schools.

The Transition Period

Time: 1925–1932.

During this period, a few new buildings built directly for use as trade schools began to appear. These were equipped with laboratories designed so that students could work out their own experiments. A neatly equipped lecture room was attached to each laboratory, but in general, the old idea about the content of the course of study and the manner in which the students should be scheduled for science, i.e., by grades, still persisted. More attention was given to failures and proposed ideas for eliminating them were numerous.

One of these ideas proposes that the old course of study should be scrapped, at least insofar as continuity of grades was concerned, and that the experiments be regrouped according to their relative importance to each trade. The boys would then report for science by shop groups and, starting at the beginning, would work through the list of experiments pertaining to their trade as fast as they individually could — the instructor furnishing the connecting link between theory and shop by means of lectures and pictures as before.

This scheme was fought tooth and nail by proponents of the old method, the principal reason for its unworthiness or unworkableness being advanced as:

"Inability to give tests to unequally advanced groups.

"Unevenness of groups as to advancement in math and English.

"Some shop groups very small and others very large.

"Necessity for formal mastery of each succeeding step in science."

The controversy raged so fiercely that eventually it was tentatively agreed to give science in the formal manner up through the 10A grade, and then to route the shop groups through what might more nearly be called *applied science.*

This *"applied science"* by shop groups brings up the question of just what equipment will be necessary, what the content of the course should be and how to grade for success or failure in such a science course.

The New Idea

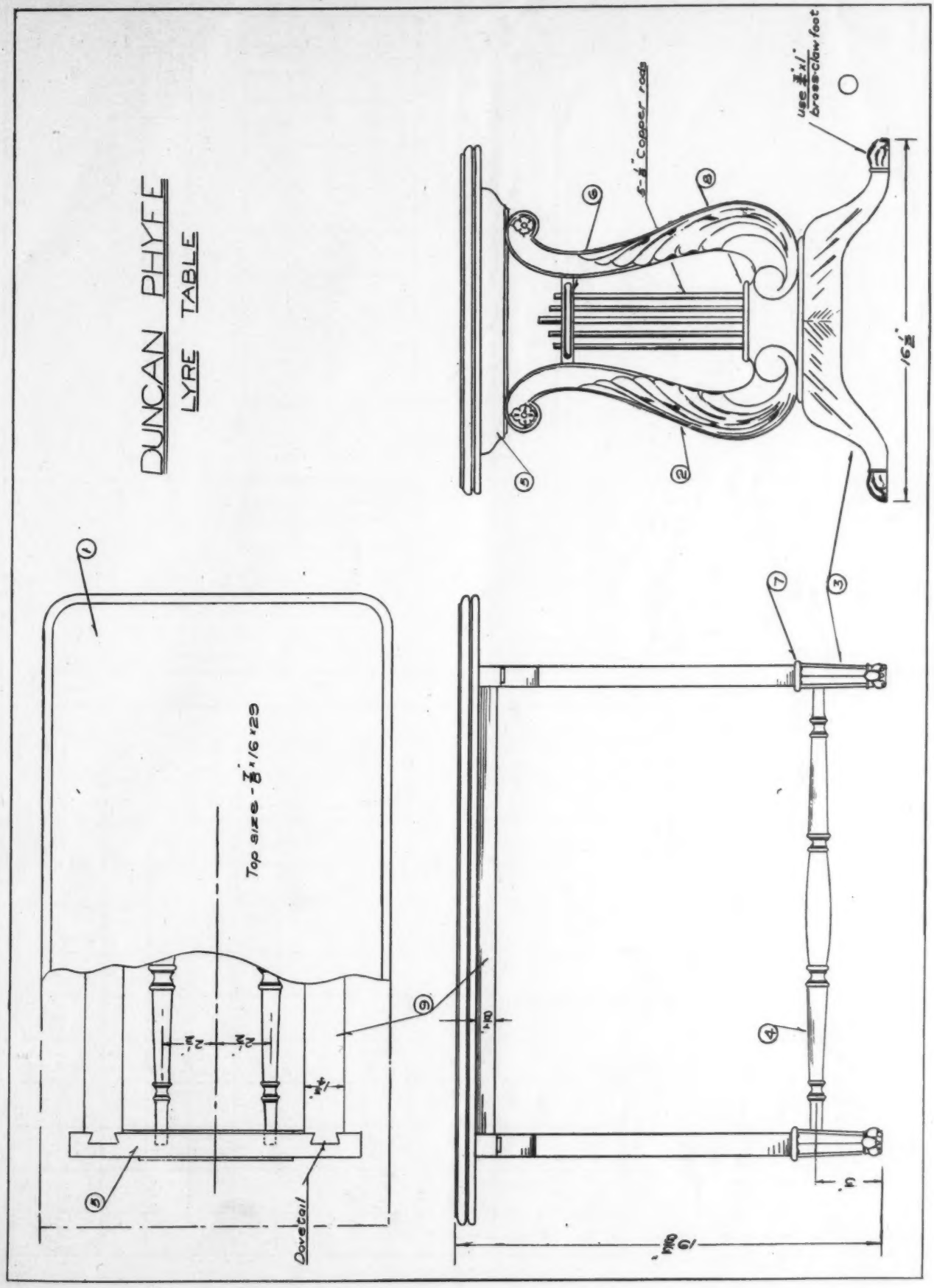
Time: 1932 through to the present.

This new idea involves a totally different interpretation of the term *science* than we have been accustomed to give to it in the trade-school curriculum. In the past we have regarded it somewhat in the light of the mathematics courses — as something which, to be effective, must develop through progressive stages of difficulty from 9B to 12A — with chemistry tagged on to the 12B and 12A semesters because *it was the hardest,* while, as a matter of fact, chemistry can be one of the easiest branches of trade-school science, if approached properly.

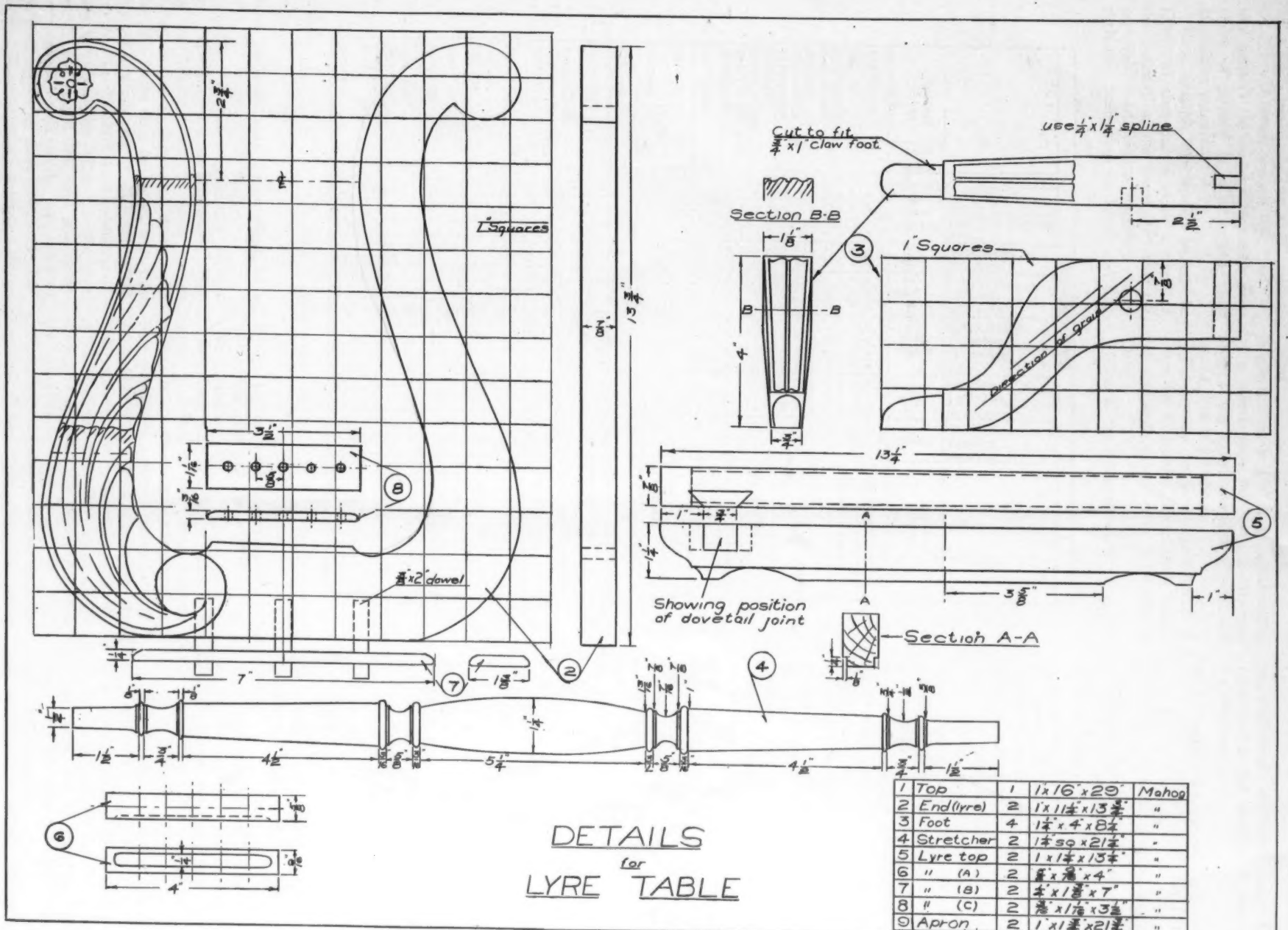
Also, is it not more logical to consider *science* as a study of certain physical or chemical phenomena affecting the various materials used in the trades? For instance: Do we need to teach the laws of the three levers with a lot of theoretical problems, in order to illustrate to a boy the action of various kinds of timber under a bending stress? Do we have to teach all of the theory of the absorption of heat or cold by liquids in order to show a boy how to correct hydrometer readings of the specific gravity of a storage-battery solution to the temperature at which the test was made? Do we have to teach two semesters of theoretical chemistry before we can demonstrate the electrolytic theory of iron corrosion so that a trade-school student of the advanced shop group can understand it? Most emphatically, no, to all of these questions.

In the materials laboratory of the Clifford B. Connelley Vocational High School at Pittsburgh, Pa., under the author's supervision a plan has been worked out, lesson sheets prepared, and grading sheets written and checked to the end that *science,* as we have discussed it, exists no longer, but that through a study of the materials of his trade the

(Continued on page 247)



Designed by Earl Harmes, Shorewood High School, Shorewood, Wisconsin. *(See page 255 for description)*



1	Top	1	1 x 16" x 29"	Mahog
2	End (lyre)	2	1" x 11" x 13"	"
3	Foot	4	1" x 4" x 8"	"
4	Stretcher	2	1" sq x 21"	"
5	Lyre top	2	1 x 1" x 13"	"
6	" (A)	2	" x " x 4"	"
7	" (B)	2	" x 1" x 7"	"
8	" (C)	2	" x 1" x 3"	"
9	Apron	2	1 x 1" x 21"	"

Designed by Earl Harmes, Shorewood High School, Shorewood, Wisconsin. *(See page 255 for description)*

(Continued from page 242)

boy masters the essential scientific principles of science in a new and more fascinating manner.

To accomplish this, it must be kept in mind (*a*) that this is to be a study of the materials of the trades, (*b*) that the materials most vitally important to a particular trade must be listed, and that these materials must be arranged in a practical sequence for study.

The author has attacked the problem by: (1) Listing a series of some 40 physical and chemical tests of many various materials used in the trades. These, with the help of the shop instructor, were then selected and grouped for each shop class. (2) Listing the three fundamental materials for which the Pittsburgh district is noted, i.e., coal, oil, and steel, and including these with tests, in the materials-testing program for all shop groups. (3) Preparing 2 or 3 elementary or lead-up lessons in physical as well as in chemical testing of a nature such that even a 9th-grade student may gain some idea of what this testing idea is all about.

The present setup at the Clifford B. Connelley Vocational High School for the various shop group tests is shown in Table I.

None of the lesson sheets on these tests involve any mathematics beyond decimals and square root and the work is not of college grade.

SHOP GROUP TESTS

Chemical Tests	Trade Group	Special	Electricity	Paper	Wood	Bldg. Trades	Auto	Metal	Physical Tests
Glassware		* o	* o	* o	* o	* o	* o	* o	5 Physical Tests
Use of Hydrometer		* o	* o	* o	* o	* o	* o	* o	Apparatus Used
Analytical Balance		* o	* o	* o	* o	* o	* o	* o	Graphs
Filtration and Trituration		* o	* o	* o	* o	* o	* o	* o	Tension
Chemical Calculations		* o	* o	* o	* o	* o	* o	* o	Compression
Qualitative and Quantitative		* o	* o	* o	* o	* o	* o	* o	Shear — Metals
Corrosion		* o	* o	o o	* o	* o	o o	* o	Bending
Carbon	Iron & Steel	* o	* o		* o	* o	* o	* o	Torque
Sulphur	Iron & Steel	* o	* o		* o	* o	* o	* o	Brinnell Hardness
Silicon	Iron & Steel	* o	* o		* o	* o	* o	* o	Ductility S.M.
Volatile	Gas & Oil	* o	o o	o o	o o	* o	o o		Sand Analysis
Evaporation	Gas & Oil	* o	o o	o o	o o	* o	o o	o o	Cement and Concrete
Viscosity	Gas & Oil	* o	o o	o o	o o	* o	o o	o o	Brick and Tile
Flash Test	Gas & Oil	* o	o o	o o	o o	o o	o o	* o	Foundry Sand
Carbon Residue	Gas & Oil	* o			* o	* o	o o		Moisture
Sweet or S.	Gas & Oil	* o			* o	* o	o o		Tension Compression — Timber
Fiber and Size		* o	o o	o o	* o	* o			Bending and Cleavage
Inks and Paper		* o		o o	* o	* o			Shear
Stains, Varnishes, Fillers		* o	* o	* o	* o	* o	* o	* o	Proximate Analysis — Coal
Paints		* o	* o	* o	* o	* o	* o	* o	U.S. Steel Dist. — Coal

Table 1. Shop group tests

Procedure in the laboratory: Each trade group of lesson sheets (Auto, building, paper, etc.) is mounted in blueprint book form and filed in a cabinet under the trade-group heading. A library of approximately 150 volumes of chemistry, physics, A.S.T.M. Stds., and other books on the subject of materials are kept available in the laboratory.

As each shop group reports for class, the instructor divides it into groups of various accomplishment levels with respect to their experience in the materials laboratory, as for instance:

25 draftsmen — 6 beginners 8–2nd-sem. boys
5 adv. 11th- and 12th-grade boys
6 adv. co-op students

The beginners will start to work on the lesson "Five physical tests"; the 2nd-semester boys perhaps on the Brinnell or shear tests; the advanced boys perhaps on some of the chemical jobs. The author has found the co-ops to make pretty good lab assistants, they being among the oldest and most experienced students.

As each group finishes its write-up and actual machine test of the material, a job grading sheet is used. This contains test questions of the true-false variety and a program for marking the notebook, allowing so many points for neatness, sketches, excellence of write-up, problems, etc., the notebooks are reversed in the class and graded by the students themselves under the supervision of the instructor or his assistant.

The notebook counts 67 per cent and the examination mark 33 per cent. It is possible to earn a total of 100 points on each job, and the final grade for the job is arrived at as follows: Under 50 points, U — unsatisfactory; 50 to 85 points, S — satisfactory; 86 to 100 points, A — superior. As soon as the grades are recorded the group proceeds with the next assigned test.

Summary

To sum up the advantages of this so-called "new deal" in science from the student's point of view:

1. He learns definite, usable facts about the materials of his trade and thereby becomes a better mechanic.
2. He learns them in a manner impossible to pursue in the average shop due to lack of equipment.
3. His interest is very easily held and he learns more easily.
4. He marks or grades his own work and thereby knows just why each part of the required work was essential to its success.
5. The poorest worker comes to know that he has the same chance to make an A as his pal in the group and that the instructor does not "take it out on him" through his mark.
6. He can proceed as fast as his natural ability will permit.

It is said that "The proof of the pudding is in the eating" and the author can truthfully say that since the plan has been in effect in his laboratory, he has observed the following facts:

a) In a favorite-subject questionnaire

presented unexpectedly to the boys by the school administration, this laboratory rated highest among a group of four in science.

b) That of approximately 150 reference and textbooks unlocked and available for use constantly in the laboratory and to be taken home by the boys, the loss has only been about 2 per cent per school year.

c) Our tools and equipment are unlocked and are used by approximately 500 different boys per school year and we have lost only two 50-cent crescent wrenches in five years.

d) No homework is required and sufficient time is allowed in school for all work to be completed, yet about 250 boys per semester sign up for book loans and take their work home.

This is *voluntary* on their part and many also report *voluntarily* to the laboratory for extra-time work.

e) Since the plan has been in effect the failing grades given to students in this laboratory are 50 per cent lower than formerly.

Rubber Stamps as a School Project

Arthur F. Dodge

Assistant Professor of Industrial Education, University of Illinois, Urbana, Illinois

An activity not commonly found in the school shop.

About two years ago the writer[1] pointed out that the industrial life and methods of production as presented to pupils by most of our school shops are far from modern.

Wood, which is constantly decreasing in importance in modern industry, is still the most commonly used material in the school shop. On the other hand, rubber and the phenolic resins are increasing rapidly in importance in industry but are practically unknown in the school shop.

It was a very simple matter to point out these conditions in the previous article but a much more difficult matter to suggest suitable projects involving the use of these materials. The writer believes he has found in the making of rubber stamps a project which teaches something of the working properties of these materials and opens up to the pupil a vision of their many possible uses.

It is not recommended that a special shop be set up for the making of rubber stamps. Rather, it would be better to introduce this work as a part of a general shop. Some manual skills are involved in the making of these stamps but the principal benefit to be derived is the knowledge acquired of the working properties of rubber and of the plastic materials from which the molds are made. Also, the interest created in these materials may serve as a basis for a wide range of reading on the uses of these materials in modern industry.

Rubber stamps can be made with very simple equipment. First, a mold is made by setting ordinary printer's type and pressing it into a plastic compound. Uncured rubber is then pressed into this mold and vulcanized.

Probably the best plastic material to use for the mold is Bakelite or a similar phenolic resin. This may be bought in sheets at approximately 75 cents a pound. Sheets approximately 3/16 in. in thickness are best for this purpose. Cut a piece from this sheet large enough to well cover the type as set up in an all-metal printer's chase. Heat the press to a temperature of 350 degrees Fahrenheit. Place the form, with a sheet of phenolic resin on top of it, in the press and allow it to remain for about three minutes without applying pressure in order to soften the plastic. Then apply pressure and keep temperature at about 350 degrees for another ten minutes to complete the curing of the mold.

This mold is then used for forming the rubber for the stamp. Unvulcanized rubber in sheets 1/16 to 3/32 in. in thickness should be used for this purpose. This may be bought at approximately 65 cents per pound. Cut a piece from the rubber sheet large enough to cover the mold. Place the uncured rubber on top of the mold and place both in the press which has previously been heated to about 300 degrees F. Apply pressure two or three times to expel all air and then leave under pressure at the 300-degree temperature for four or five minutes. Now remove pressure and allow to cool for about 5 minutes. The rubber is then ready to remove, trim, and mount on a wooden block for use. Mount-blocks of wood may be purchased complete with paper and transparent celluloid for making a celluloid-covered identification label, or these mount-blocks may be made by each pupil as an integral part of the project.

The same press may be used for first making the mold and then vulcanizing the rubber stamp. A small electrically heated press may be bought for about forty-five dollars, or a gas-heated press for about twenty dollars. Cuts of two such presses are shown below. However, the average shop teacher should be able to construct a homemade press or hand clamp which will give satisfactory results. It must of course be all metal to undergo the vulcanizing temperature.

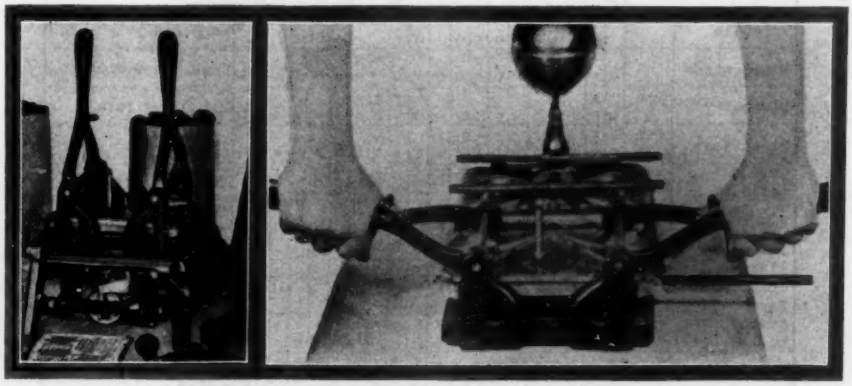


Fig. 1. Two types of vulcanizers

[1]Dodge, Arthur F., "New Materials and Possibilities in Teaching Industrial Arts," *Industrial Education Magazine*, Vol. 37, No. 4 (September, 1935), p. 215.

INDUSTRIAL-ARTS WORK

Industrial arts appeals to many persons because it provides natural, life-like settings. The tools and the materials of instruction are clearly representative of the world of work. The atmosphere is one that is conducive to freedom of thought and of action. Independence is encouraged; resourcefulness is rewarded; co-operation is invited; participation is all but irresistible. — *F. Theodore Struck.*

Printing in the Seventh Grade

Harold H. Kirk

Langley Junior High School, Washington, D. C.

A list of problems and suggested activities for the pupils of the beginner's class in printing.

What shall we teach boys in the junior-high-school printshop during the seventh or eighth grades? Originally the shops were equipped for vocational training — so-called prevocational printing. But, today we readily realize that vocational techniques and trade skills are out of the question for these small youngsters.

They are physically, emotionally, and academically immature and unprepared for highly skilled training. What shall we give them, then, that will promote their growth, experience, and avocational training along profitable, general-education lines? How can we create a real industrial-arts world in which they can learn something of the graphic-arts industries?

The following list of very elastic problems and suggested activities for youngsters in the school printshop during the seventh or eighth grades, are presented for what they may be worth. The materials here are for an eighteen-week semester of two double periods a week. They are not set up as a course of study, but rather, they are a series of problems that may aid us in liberalizing printing in our avocational classes. It is an attempt to encourage other activities in the shop besides that of sticking type.

Activity for Seventh-Grade Printing

1. Introduction into the graphic arts:

Talk and definition of the different phases of the subject.

Demonstrations, tour of the shop, etc.

Explaining course and having the boys suggest things they would like to do — giving the boys the opportunity to feel they are a part of the planned activity.

Learning names of shop equipment and tools.

Introduction to the lay of the case.

2. Planning and making a printshop notebook or scrapbook:

Cutting of paper to size.

Learning use of paper cutter.

Facts about the sizes and weights of paper.

Folding, stitching, or punching.

Learning use of Boston stapler, or punch.

Marbling of cover.

Binding, cloth or paper.

3. History of paper and papermaking:

Writing of short essays on papermaking, using shop and school library references.

Demonstrations — making of paper in the class from wood pulp.

Talk — showing samples, kinds, and weights of paper.

Pasting small samples into notebook.

4. Further definitions and demonstrations:

Early methods of printing.

Relief printing, illustrated with linoleum block.

Wood block, illustrated by pulling wet proof.

Lithography.

Engraving.

5. Trip to a museum (Smithsonian Institute, if near Washington, D. C.) to study:

Obtain samples to be used in the classroom.

Early alphabets, hieroglyphics, cuneiform writing, etc.

Iron money, and playing cards.

Papyrus, vellum, and clay tablets.

Manuscripts and scrolls.

Early type faces.

6. Further class demonstrations:

Get cider press or wine press to put over principle of Gutenberg press.

Secure samples of Gutenberg types.

Get reproductions from Gutenberg bible.

Make ink balls.

Get brass matrix to explain typesetting machines.

Linotype, intertype, Ludlow, linograph, etc.

7. Drawing and designing of alphabets:

Study lower case, upper case, and small caps, etc.

Review the lay of the type case.

Study ascenders and descenders.

Learn parts of a piece of type.

Type heights in different countries, etc.

8. Reference work for notebook along with typesetting exercises (typesetting problems based on time, group intelligence, and desires of the boys):

Compositions on the dark ages, the Crusades, the scribes in Europe, etc., and their relation to the coming of printing.

Printing.

Gutenberg.

Manutius.

Printing in England.

Caxton.

9. Learning to use the printers' tools further:

Punctuation marks.

Quotes, indentions, paragraphing, etc.

Italics, proofreading, etc.

Symbols, small caps, ligatures and logotypes, etc.

10. Review and discussions:

Objective tests.

Discussion of the printing trade in light of pupil's activity so far — What do you want to know?

How much do you need to know about printing?

Get expression of group as to likes and dislikes of various phases of the printing industries.

Ways of improving the printshop course.

11. History of American printers:

Printing in Mexico.

Stephen Daye and William Bradford.

Benjamin Franklin, life, printer, statesman, inventor, etc.

Modern printers.

Write up notes for notebook.

12. Freedom of the press — the newspaper and the school:

Publications.

A tour of a newspaper plant.

Discussion as to how school paper is put together.

Add notes to notebook.

13. Finishing elementary typesetting exercises and setting up of things of pupils' own liking (developed through class discussion):

Birthday cards or greeting cards, poems, etc.

Boy-scout merit work: Point system, bookbinding, etc.

Clubwork: Affiliation with the National Student Graphic Arts Society, 719 15th Street, N.W., Washington, D. C.

14. Tests on paper, ink, type, tools, by multiple-choice questions:

Review.

Class discussion.

Spelling matches.

Identification quizzes.

Oral tests.

Pupils writing down facts they wish answered.

Checking up on the characters in the job cases.

15. Integration with the academics:

History: Printing education week (Benjamin Franklin).

English: Punctuation marks, paragraphing, capitalization, etc.

Science: Colors, printing inks, machines, etc.

Art: Book marks, greeting cards, wood carving, linoleum-block making, drawing and layouts, etc.

Mathematics: Cutting and estimating paper stock, point system, etc.

16. Practical knowledge of duplicating devices:

Demonstrations of: Mimeograph stencils, carbon paper, blueprints, photo negatives, lithography, stereotyping, photo-engraving, silk screening, rubber and chalk plates, etc.

17. Learning the care of and safety around the power machines:

Oiling and washing presses.

Learning safety rules and applying them around machines.

Use of paper cutter, how to use and handle paper.

Names and parts of machines.

Mixing inks.

Color notes for notebook.

18. End of semester:

Cleaning up shop.

Greasing machines for summer, if spring term.

Putting away equipment and stock, etc.

Cleaning and checking up on cases.

Handing in notebooks for rating.

Test, made up of questions suggested by the boys during the term.

Selected References

Haynes, Merritt W., *Student's History of Printing*, McGraw-Hill Book Co., Inc., New York City, 1930.

Oswald, John Clyde, *Benjamin Franklin, Printer*, Doubleday, Doran & Co., New York City, 1917.

Hillyer, V. M., *A Child's History of the World*, Appleton-Century, New York City.

Hunter, Dard, *Paper-Making in the Classroom*, Manual Arts Press, Peoria, Ill.

Kimber, Sidney A., *The Story of an Old Press*, The University Press, Cambridge, Mass.

Porte, R. T., *Letters to a Printer's Devil*, Port Publishing Co., Salt Lake City, Utah, 1924.

Clark, Florence E., *The Printing Trades and Their Workers*, International Textbook Co., Scranton, Pa.

Book Binding Merit Badge Pamphlet, Boy Scouts of America.

Klinefelter, Lee M., *Bookbinding Made Easy*, Bruce Publishing Co., Milwaukee, Wis., 1935.

Printing Merit Badge Pamphlet, Boy Scouts of America.

I.T.U. Lessons, Unit I, Lesson 5; Job Unit IV, Lesson 6; International Typographical Union, Indianapolis, Ind.

Stamp Box

Leon H. Baxter

Association for Crippled and Disabled, Cleveland, Ohio

The eighth of a series on an interesting art-metal project.

The stamp box shown in Plate 9 is made of 18-gauge copper throughout with the exception of the design decoration which is of 20-gauge brass.

The four sides are first made of a piece ⅞ by 10½ in. Saw and file accurately to a square edge and planish on one surface. Measure 3 in. from the left end and square a line across the piece. Continue at 2¼, 3, and 2¼ in. Be sure the two extreme ends are square and true, and then file them at a 45-deg. angle for a neat joint fit.

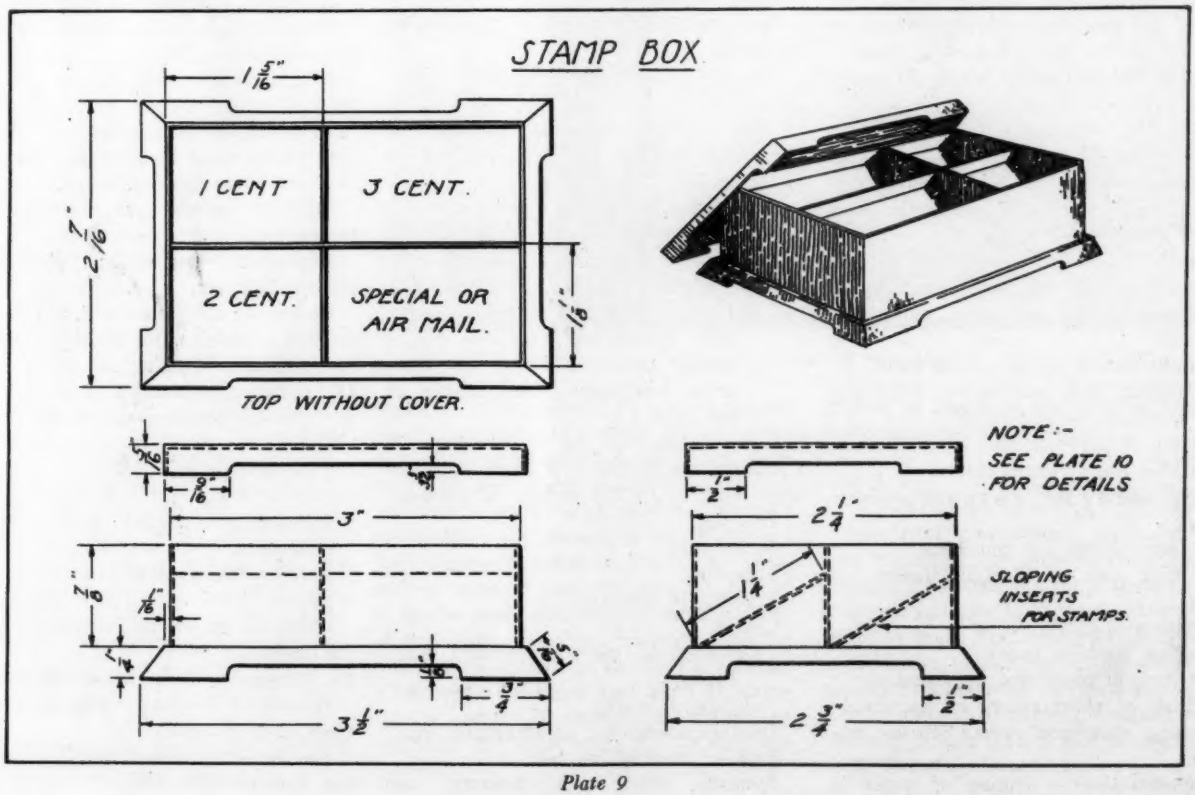


Plate 9

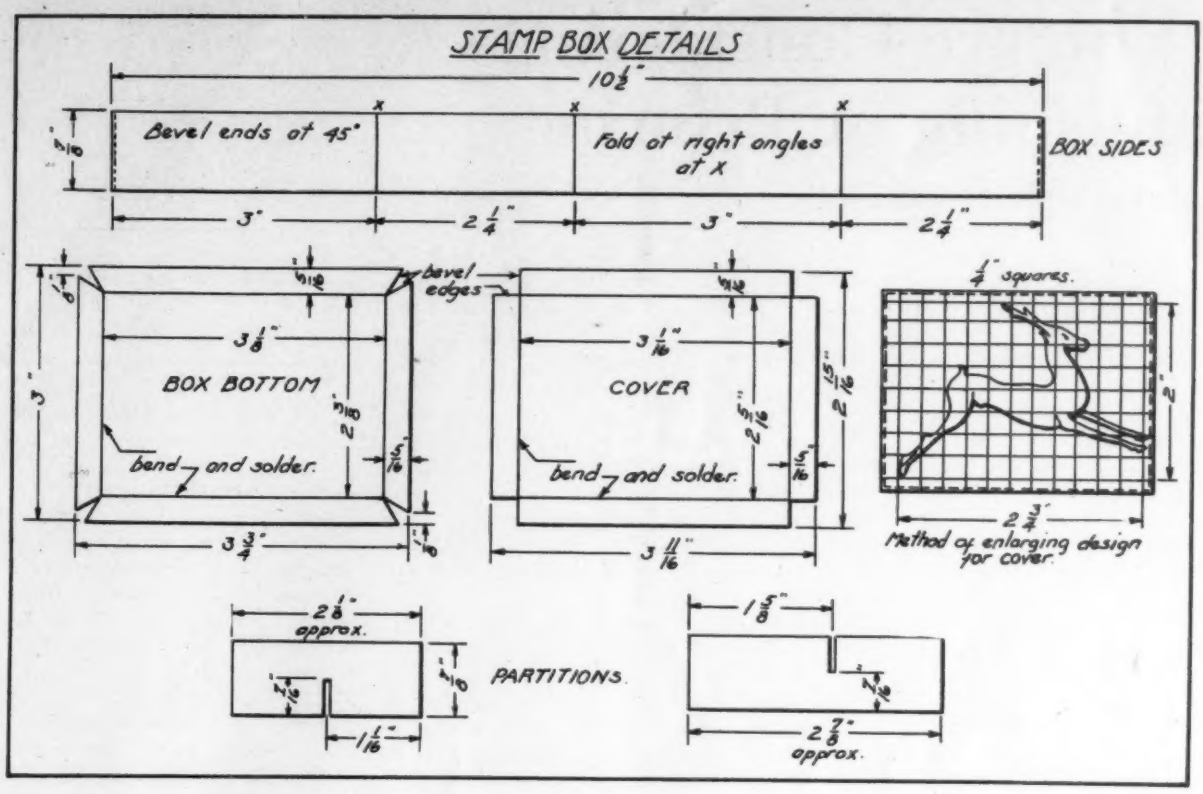


Plate 10

Bend to shape, wire firmly, apply flux and bits of solder to the inside of joint edge, and apply the heat until the solder flows freely along the joint.

Next, make the base or box bottom out of a piece 3 by 3¾ in. Mark and saw out the V-shaped angle cuts at each corner. Mark a line all around 5/16 in. from and parallel to the edges. Planish the entire surface, anneal, and bend on these lines until a perfect angle joint is obtained. Turn the work over, clean it, apply flux and bits of solder, and apply heat to make a tightly soldered joint.

Place the rectangular side in position upon the base, being sure it fits snugly. It is a good plan to wire the side tightly to the base. Apply flux and small pieces of solder on inside joint edge and apply heat. Clean in pickle, dry, and rub with fine emery.

The cover is made of a 2 15/16 by 3 11/16 in. piece, and the squares cut from each corner are 5/16 in. on a side.

Planish the top on one surface and anneal. Mark the lines for bending, 5/16 in. from each side and parallel to it. Bend to shape, then turn the cover over, clean it, apply flux, and solder it where necessary. This cover should now fit easily on the top edges of the box.

The two partitions are next made, the shorter one ⅞ by 2⅛ in., and the longer ⅞ by 2⅞ in. They should be a tight fit inside the box.

Each partition is cut halfway through, the cut being of a width to insure a tight fit with its companion piece. The long partition has its cut made 1⅝ in. from the end, the short partition one half of its length.

See that these fit snugly with each other and inside the box.

Four sloping pieces of metal are cut for each section, as shown in the end view on Plate 9, and in Plate 10. This is to insure ease of removing stamps. The four partitions hold ordinary one-, two-, or three-cent stamps, special-delivery stamps, and other large-size stamps issued for special historic occasions.

The sloping pieces are made long enough to fit tightly in their compartments and of a width to keep them all ¼ in. from the top edge. The approximate width will be found to be about 1¼ in., but may vary slightly in different boxes. Bevel upper and lower edges to insure a snug fit.

The design is, as previously stated, made of 20-gauge brass and sawed, filed, and smoothed up with steel wool. Attach to cover with solder as previously explained, being sure the edge of the cover is wired tightly while the heat is applied.

Clean all pieces in the pickle, dry and brighten with fine steel wool, and then fume.

The final finish is with fine steel wool and wax. Polish with a soft cloth.

This box, without the partitions for stamps, also may be used for a cigarette box.

Wrought iron door knocker. Designed by Thomas Googerty, Pontiac, Michigan

If You are Considering Publishing or Printing

R. Randolph Karch

Rochester Athenaeum and Mechanics Institute, Rochester, New York

A helpful analysis of these two fields.

A Career in Publishing or Printing

The professions of publishing and printing require highly developed intellectual abilities as well as effective craftsmanship. Even in this age of specialization, the many occupations within the graphic-arts industries couple labor with the efforts of the artist, the author, the statesman, and the thinker in every field of work.

Printing is the handmaid of business — without its aid, commerce as now conducted, would cease to exist. Printing is an art — from the advertising brochure to the finer type of book; printing is the medium between the artist and the consumer. Printing is an industry — with all the complexities that come in a manufacturing process. Printing is interesting —not only because of its traditions, but also in its creative processes.

The young man or woman who decides to follow a career in the profession of publishing or printing is to be congratulated, for, in the words of Henry P. Porter: "Printing is a good business. It is clean, honorable, respectable. It is celebrated as a trainer of men for higher stations in life. It has many inspiring traditions and legends. It combines the need for knowledge of everything under the sun: Mathematics, mechanics, language, spelling, grammar, color, composition, salesmanship; there is indeed no limit to the accomplishments that are required of the printer. The printer is brought into contact with all other vocations and professions. No vocation or profession can really exist without the printing press. From textbooks to novels, from pamphlets to newspapers, from tickets to tax bills, no man can evade the printed word."

Printing and Publishing Are Important Industries

In the publishing profession of the United States, the following figures will throw light on the opportunities for employment:

Daily English-language newspapers.	2,084
Weekly newspapers	10,629
Semiweekly newspapers	359
Monthly periodicals[1]	128
Total	13,200

One out of every 283 working people in the United States is employed in some form of publishing and printing. There are almost 32,500 printing establishments, large and small, scattered throughout the country. Almost every small village, in fact, has its newspaper and printshop. There is one printshop for every 3,600 of our population of 120,000,000, with 168,-514 salaried employees, and 255,635 wage earners.

Recent government statistics show that printing, listed with 273 other major industries doing an annual business of over $5,000, ranks first in the number of establishments and in value added by manufacture; second in wages paid; fourth in the value of its products; sixth in the number of wage earners, and thirteenth in the cost of materials.

[1]These figures do not include the many thousands of trade journals, lodge magazines, house organs, annuals, and such publications.

JOB CHART--PUBLISHING FIELD

BASIC TERMINAL JOBS	SUPPLEMENTARY TERMINAL JOBS
Composing-room foreman Ad-room foreman Printing engineer Pressroom foreman	Owner-operator small newspaper Advertising sales manager
BASIC INTERMEDIATE JOBS	**RELATED JOBS**
Make-up Proofreader Linotype machinist Copy cutter Stereotyper Ad compositor Linotype operator Monotype caster	Production superintendent Executive superintendent Personnel manager Circulation manager Advertising-copy writer Photo-engraver Gravure cylinder etcher Gravure pressman Electrotyper Publisher Editor Office manager Business manager Newspaper artist Cartoonist Newspaper photographer Reporter Columnist Advertising salesman
IMMEDIATE OBJECTIVES	
Make-up assistant Copyholder Assistant linotype machinist Ludlow-APL operator Elrod operator Stereotyper's helper Teletypesetter operator Bank man	

Fig. 1

JOB CHART--COMMERCIAL PRINTING FIELD

BASIC TERMINAL JOBS	
Composing-room foreman Pressroom foreman Printing engineer	Asst. offset-plate maker Asst. linotype machinist Ludlow-APL operator Elrod operator Bindery worker Stereotyper's helper Teletypesetter operator
BASIC INTERMEDIATE JOBS	**SUPPLEMENTARY TERMINAL JOBS**
Proofreader Platen pressman Cylinder pressman Layout man Estimator Rotary pressman Stereotyper Linotype machinist Stone man Bookbinder Cutter Monotype composition machine operator Monotype sorts caster operator Job compositor Linotype operator Monotype keyboard operator	Layout counselor Typographer (layout) Owner-operator commercial printing shop Printing salesman
IMMEDIATE OBJECTIVES	**RELATED JOBS**
Layout assistant Copyholder Asst. platen pressman Asst. cylinder pressman Asst. offset pressman Asst. rotary pressman	Production superintendent Executive superintendent Photo-engraver Electrotyper Office manager Business manager Artist-designer Type founder Offset-plate maker Offset pressman Photo-composing machine operator Equip. salesman Supply salesman Printing teacher

Fig. 2

An Over-All View of the Processes

The great majority of publishing and printing firms of the nation print by means of the *letterpress* process, or from *relief* types or plates. The *planograph* process, or *lithography*, including *offset* is next in line, followed by the processes of *gravure* and *collotype*. Career opportunities abound in all these fields for well-trained workers.

Workers Needed

Skilled workers are needed in the publishing and printing industries. The total number of skilled men lost by death or other causes is approximately 10,000 yearly. Less than one half of this number is now being adequately trained, according to recent data. The consensus of opinion in graphic-arts circles is that this shortage represents a dangerous deficiency, which, if not corrected in time, will seriously damage the industry.

Workers in the Publishing and Printing Areas[2]

Workers in the publishing area are employed in either the professional or mechanical types of work. The job chart for the publishing field (Fig. 1) lists the many positions held in this work. The reader may consult the job chart for the commercial printing field (Fig. 2) for information on types of work in this area.

General Personal Qualities Necessary

The general personal qualities required of workers in publishing and printing include:

1. Enthusiasm for interesting and changing work.
2. Ability to visualize the completed work while in process.

[2]The Department of Publishing and Printing of the Rochester Athenaeum and Mechanics Institute is now conducting a study of workers in the publishing and printing fields — their duties, number, etc. The results of this study will be published when completed.

3. Ability to devise new systems of work.
4. Ability to meet emergencies easily and well.
5. Good physical health.
6. Ability to work at various tasks, and to change easily from one type of work to another.
7. Ability to work regularly, amid seeming confusion and at great speed, and with others.
8. Ability to work indoors (in some types of work).

The high-school vocational counselor today knows that the requirements of publishing and printing are high, and that it takes an intelligent and industrious individual to make good in the profession. Printing and publishing today are a challenge to the man of ability in any high-school or college graduating class — they are vocations that demand a high correlation of mental and manual abilities.

Disadvantages in Publishing and Printing

In considering a career in publishing and printing, as in all fields, it is well to note that there are disadvantages to be investigated. The following are found in a few of the occupations:

1. Confining, indoor work.
2. Work in "shifts," perhaps in one of three a day covering eight hours, a "trick."
3. Fast work, and under pressure, always meeting dead lines.
4. Danger of eyestrain.
5. A very slight danger of contracting lung diseases and lead poisoning.

Training in Publishing and Printing

There are approximately 2,500 departments of printing in the various types of schools of the United States, on the following education levels:

The Junior High School. Printing courses in the junior high schools are definitely not for the purpose of training men and women for industry, but to allow for teaching, in an interesting manner, regular school subjects through the manipulation of types and materials, for consumer knowledge, and to allow students to sample the work of a major industry.

The Senior High School. The senior high schools carry further the work of the junior high school to a more advanced level. A few operate on a trade-school level, which is considered in the following.

The Trade, Vocational, and Technical High School. The trade-, vocational- and technical-high-school printing courses are established for the express purpose of training apprentices for the publishing and printing trades. Most of these courses offer training in the hand skills only, for, in most cases, any mechanical automatic equipment is busy on the production of the necessary school printing, manned by a few advanced students. Most of these schools, however, are very good in the training of purely trade workers in the various fields. Little, if any, apprentice "time" is taken from the five to six-year period of indenture to the trade — with rare exception, students must serve out their "time," regardless of the school training.

Professional-Level Printing Courses. This type of printing school offers to high-school and college graduates a course of study which should assure adequate opportunity for rapid promotion, enabling the student to achieve a desirable and economically sound position within a reasonable time. Promotion possibilities for graduates of this type of school are listed in the job charts shown in Figures 1 and 2. Courses of study at this level run from two to four years. Equipment is usually of the best, making it possible for each student to gain experiences in all areas of work, on automatic machines and in processes actually used today in the profession.

The courses in publishing and printing at the Rochester Athenaeum and Mechanics Institute are organized at the professional level.

Duties and Compensation of Employees in the Publishing and Printing Areas

The probable lines of promotion by which a young man or woman entering these industries might expect to move toward his or her ultimate job as experience is gained, and studies are pursued, are indicated on the charts shown in Figures 1 and 2.

Five type of jobs are listed: Basic terminal jobs, supplementary terminal jobs, basic intermediate jobs, related jobs, and immediate objectives. The classifications are explained in the following paragraphs:

Immediate Objectives. Men and women aspiring to the more highly paid jobs usually begin work in this area. Compensation for workers here varies widely in different localities and plants. Salaries would run from $15 to $35 a week, with the possibility of rapid advancement dependent upon the individual's ability for growth. Opportunities abound in this area. Men and women in this work operate the machines, run the presses and do the hand work, usually under the direction of those workers in the following classification.

Basic Intermediate Jobs. Application to work and study in one of the immediate occupations may be expected to result in promotion to one or more of the jobs listed in the basic intermediate classification. Here again the salary varies according to the locality and the size of the plant, where pay would range from $35 to $60 a week. The possibilities for work in this area are good, because of the scarcity of workers trained during the so-called depression period. These workers are the backbone of the industry — the men who follow the leadership of those in the executive positions in the basic terminal jobs.

Basic Terminal Jobs. Successful men in the basic intermediate jobs, who apply themselves wholeheartedly to their work and to study, often find opportunity awaiting them in one of the basic terminal jobs. Salaries of executives of this type vary from $50 to $250 a week. Upon these individuals rests the success of the businesses. They must be good leaders, they must know their subject thoroughly, they must study and devise new and better methods of making money for the shop in a highly competitive profession. Opportunities in this area are dependent almost entirely upon the ability of the individual.

Supplementary Terminal Jobs. Salaries of men in this bracket vary according to their ability to produce and to direct work in their private practice or in the larger plants. Compensation would run from $65 to $250 a week.

Related Jobs. A thorough knowledge of one or more of the graphic-arts processes is required of workers in this classification. Dependent upon ability, the pay would run from $50 to $250 a week in the salaried jobs, or in commissions commensurate with sales. There are very many opportunities in some of these jobs; very few in others.

All Areas. In all areas, the normal growth of the industry and the general economic development will determine the opportunities of the future. In general, the well-trained person should be able to find opportunities for advancement beyond those of one who has not had the advantages of an adequate educational background and a comprehensive technical training.

A man's accomplishments will rise no higher than his ambition. — *F. W. Nichol.*

Good will is the mightiest practical force in the universe. — *Charles Fletcher Dole.*

Testing and Tests

METALWORKING TEST

G. L. Simnicht
High School,
Elk River, Minnesota

INSTRUCTIONS:

1. Certain words have been left out of the sentences below.
2. Underlined spaces show where the words are left out.
3. You are to write in the underlined spaces, the words which have been left out.
4. Study the sample carefully before beginning actual work.

SAMPLE:

1. To saw metal by hand, use the *hack saw.*

TEST STATEMENTS:

1. The most common blade used in this saw is ——— to ——— inches long. *8, 10*
2. The most common blade has ——— teeth per inch. *18*
3. The cutting edge of the teeth should point ——— from the handle. *away*
4. The pressure should be applied on the ———stroke. *forward*
5. A ——— stroke should be used when sawing. *long*
6. A blade of this kind has ———. *set*
7. When sawing, about —— to —— strokes per minute should be made. *30, 40*
8. For cutting sheet metal by hand, ——— are used. *tin snips*
9. Chisels used in metalwork are known as —— chisels. *cold*
10. The two most common types of chisels used on metal are the —— chisel, and the ——chisel. *flat, cape*
11. The chisel used for cutting metal should be ground to an angle of —— deg. for most work. *60*
12. There are two kinds of tin snips, the ——— blade and the ——— blade. *straight, curved*
13. The keyways in pulleys or shafts may be cut with a ——— chisel. *cape*
14. Five common types of files are: ———, ———, ———, ———, ———. *mill, round, flat, square, half round*
15. When ordering files, their ———, ———, and ——— must be specified. *length, kind, cut*
16. The common cuts on files are the ——— cut and ——— cut. *single, double*
17. When filing, pressure should be applied on the ——— stroke and released on the ——— stroke. *forward, backward*
18. A ———— may be used to clean a file. *hardwood block*
19. ——— filing is done to obtain a very smooth surface. *Draw*
20. A ———— is used for cutting round holes in metal. *twist drill*
21. The size of a drill may be determined with a ———. *drill gauge*
22. The parts of a drill are: ———, ———, ———. *Shank, body, lips*
23. When grinding a drill, the angle of clearance should be from ——— to ——— deg. *12, 15*
24. ———— may be used as a lubricant for drilling most metals. *Machine oil*
25. A ———— should always be used to start a drill in iron. *center punch*
26. A ——— drill is used to turn drills in light work. *hand*
27. On all drilling devices a ——— is used to hold the drill. *chuck*
28. When drilling a large hole, it is a good idea to use a ——— hole. *pilot*
29. A hole may be enlarged to its required size by the use of a ———. *reamer*
30. This tool is turned with a ———. *tap wrench*
31. It is always turned in a ———— direction. *clockwise*
32. A ———— is used to enlarge the end of a hole to take a flathead screw or bolt. *countersink*
33. A ——— is used for cutting inside threads. *tap*
34. A ——— wrench is used to turn this tool. *tap*
35. A ———— is used to cut threads on water pipe. *pipe die*
36. A ———— is used to cut threads on a round bar of iron. *threading die*
37. ——— oil should be used for cutting threads. *Lard*
38. A ———— is used to make a round hole square. *broach*
39. ———— is one of the natural abrasives. *Emery*
40. ———— is used for polishing metal. *Emery cloth*
41. It is usually sold in sheets measuring ——— by —— inches. *9, 11*
42. To prevent rust, —— may be used on the ——— cloth. *oil, emery*
43. Polishing metal with a round revolving cloth wheel is known as ———. *buffing*
44. ———— are used with a cloth wheel, when polishing. *Tripoli and rouge*
45. Cloth wheels are made of ———. *cotton*
46. Name one other material for polishing that has not been mentioned in this test. *Steel wool*

TEST FOR GENERAL METALWORK

G. L. Simnicht
High School,
Elk River, Minnesota

DIRECTIONS: If the statement is true put a plus sign in the ( ) at the end of the statement. If it is false put a 0 in the ( ).

1. In some parts of Minnesota pure iron is found. ( )
2. Mexico has an abundance of iron ore. ( )
3. Cuba ships iron ore to the United States. ( )
4. Sweden ships iron ore to the United States. ( )
5. Limestone is used to remove impurities from the iron ore. ( )
6. A blast furnace is over 100 feet high. ( )
7. Steel is mined in Wisconsin and Michigan. ( )
8. A hammer is made from pig iron. ( )
9. Steel may be hardened by heating and dipping in oil. ( )
10. Cast iron contains a great deal of carbon. ( )
11. Cast iron is fairly strong. ( )
12. Cast iron is brittle. ( )
13. Manganese is one type of cast iron. ( )
14. Wrought iron contains no carbon. ( )
15. The more carbon a metal contains the harder it becomes. ( )
16. Open hearth is the name of a method of making steel. ( )
17. Electric steel is made by the Bessemer process. ( )
18. As iron comes from the blast furnace it contains many impurities. ( )

19. A blast furnace can only be run in the daytime. ( )
20. A modern blast furnace produces about 50 tons of iron per day. ( )
21. Molds for casting pigs may be made of iron or sand. ( )
22. Wrought iron is hard and brittle. ( )
23. Most tools are made from cast iron. ( )
24. Bessemer steel is the cheapest kind of steel. ( )

Key

1. (0) 2. (0) 3. (+) 4. (+) 5. (+) 6. (+) 7. (0) 8. (0) 9. (+) 10. (+) 11. (+) 12. (+) 13. (0) 14. (0) 15. (+) 16. (+) 17. (0) 18. (+) 19. (0) 20. (0) 21. (+) 22. (0) 23. (0) 24. (+)

Problems and Projects

DUNCAN PHYFE LYRE TABLE

Earl Harmes, Shorewood High School, Milwaukee, Wisconsin

Perhaps the most popular project in furniture making for the student and craftsman alike has been the table. This is, of course, easily understood when one analyzes the purpose and the importance of the table in the general plan of the average home. Practically every home can use another table, either to replace one, or to add to the present home equipment. It is for this purpose that the writer suggests considering the small Duncan Phyfe table illustrated in Figure 1. The design is particularly adaptable to almost any room arrangement, especially if used as a coffee table, or as a side, or end table. At a glance one might suspect or feel that the construction is beyond the ability of the average high-school boy or home craftsman.

After studying the detail drawings, shown on pages 243 and 245, is becomes evident that the problem is merely one of simple turning and band-saw work. Notice how, in the detail drawing the entire table is disassembled. After the patterns are laid out and cut it is merely a case of making piece by piece. Even the joints are of the simplest kind to construct. It might be of interest to know that the table in the photograph represents the first attempt on the part of a student. This point has been brought out to show that there are no hidden difficulties involved in the construction. It is unnecessary to go into detail regarding the details of construction because the drawings have been made up so that even the inexperienced student can proceed without fear of trouble.

The acanthus-leaf carving on the lyre is of the simplest kind. The detail drawing shows a relief of the carving to show the depth required and the form to follow. The amateur or one who has had no experience in carving can arrive at the same effect by simply lining the design with a ⅛-in. V tool, or a gouge of the same size.

The finish used should, of course, be the red mahogany typical of that used on all Phyfe furniture.

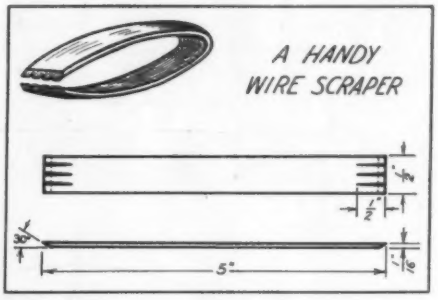
Fig. 1. Duncan Phyfe lyre table

A HANDY WIRE SCRAPER

Walter C. Van Buren, George Wythe Junior High School, Hampton, Virginia

Many times, when working, in the electrical shop, the student finds it necessary to make connections to enameled wire. The task of scraping the enamel from the wire, while only a minor one, is, nevertheless, a troublesome one, especially if it is done with a knife.

The wire scraper illustrated is a handy little tool which is easier to handle, and which does the work more efficiently and more quickly than a knife. It is made of a piece of spring steel or an old clock spring.



Cut off a strip of steel about 5 in. long from a strip ½ by 1/16 in., and file or grind the ends to an angle of about 30 deg. as shown in the accompanying sketch. Next, file three grooves on each end so that when the strip is bent the grooves will coincide. These grooves may be either V shaped or half round.

Bend the strip to the shape shown in the drawing, so that the two edges will be about ⅛ in. apart. The tool should then be hardened and tempered. If the scraper is made from an old clock spring, the metal must first be annealed by heating it to a bright red, and allowing it to cool. It may then be filed and bent to the proper shape, after which it should be hardened and tempered.

To use the scraper, hold it in the right hand and place the end of the wire between one set of grooves in the jaws. Press the jaws tightly against the wire and draw the scraper toward the end of the wire. Release

the pressure, turn the wire slightly and repeat the process two or three times until the wire is bright.

TRELLIS

Louis F. Barocci, High School, Cudahy, Wisconsin

This type of trellis has been built in our shops for a number of years with much success. Strips are ripped from 1-in. rough basswood or pine in thicknesses varying from ¼ to ⅜ in., and any lengths desired. All sides of these strips should be planed, and then they should be clamped together with a hand clamp for the boring operation, using a No. 4 auger bit for the ¼-in. dowel rods and the ¼-in. carriage bolts. The ground stakes are made of a piece of ½ by 1 by 30-in. hardwood. It is fastened to the strips with the bolts. If a large, wide trellis is desired, use two 36-in. dowel rods, and only one if a narrow trellis is wanted. When using two dowel rods, it is necessary to have an odd number of vertical strips and the center strip must be reinforced on both sides at the point where the dowel is inserted. The dowel rods are fastened to the strips with ¾-in. brads.

The remaining design of the trellis may be varied to suit the taste and originality of the builder. The entire trellis is then painted.

The blueprint illustrates two trellises fastened together with four carriage bolts to make one large trellis.

INTRODUCING A SWITCH PLATE MADE OF PLASTIC MATERIAL

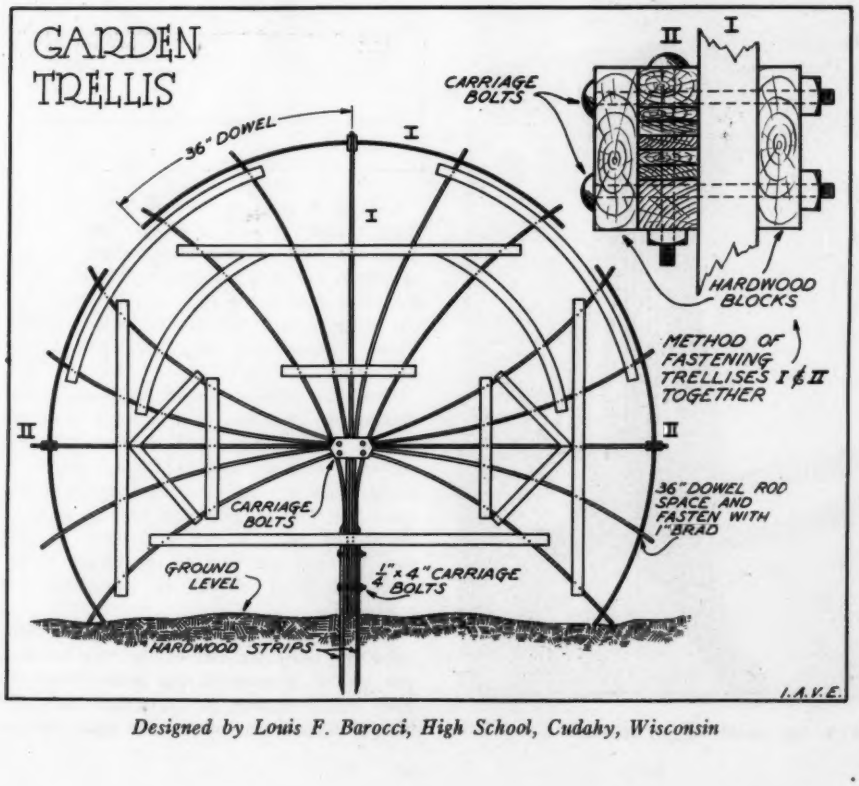
J. B. Livingston, Ponca City, Oklahoma

We had grown tired of those conventional-shaped wall switch plates which cover the electric-light switches and the outlet plugs. With the advent of this new material commonly called plastics, which is being used in so many interesting and practical ways, we decided to try it in making up a set of new switch plates in an entirely different design. We found this material to have a very high dielectric value, consequently entirely safe for the use in mind.

The old metal plates were not large enough to prevent fingerprints from soiling the walls all around them, so we decided to make the new plates larger in area wherever the woodwork adjoining them would permit. The old plates were tarnished and unsightly from long use, but now we have brilliantly lustrous switch plates that do not stain nor show fingerprints.

For the breakfast room, we cut the pattern to suggest a pot of spring flowers (Fig. 1); for the bathroom just a perfect circular shape about 6 in. in diameter (Fig. 2), and for the children's bedroom an outline of Peter Rabbit as illustrated in Figure 3. Other pattern suggestions are shown in the drawings. Even though you have a different design in mind, here is how to proceed with its construction.

Fig. 4. Showing method of using old switch plate for pattern for openings in the new plate



Designed by Louis F. Barocci, High School, Cudahy, Wisconsin

Materials and Tools Required

From the supply house selling such materials, obtain a piece of sheet stock 3/16 by 6 by 8 in. in the color desired, which in our case was mottled ivory for the basket of flowers, brown onyx for the circle, and white for the rabbit shape. The tools you will need for this project are a coping saw fitted with a fine-tooth blade, brace with ⅜-in. and 3/16-in. twist drills, ½-in. wood chisel, countersink, flat file, fine garnet paper, also No. 320 and No. 240 grits of Speedwet paper, buffing compounds Nos. 1 and 2, and a buffer.

Procedure

There is a glazelike finish on the plastic sheet when it is received. Remove this with the garnet paper for best results in transferring the pattern. Transfer the pattern to the material either by the use of carbon paper or by tracing all around the outline if the shape you are adopting is already cut out. With the coping saw, cut out around the outline leaving just a little stock outside the lines so you can dress the material down to the exact pattern with the file. Using the flat file and the garnet paper, remove all

traces of saw marks from the edges and also round the edges on the front side slightly.

Now determine the position of the openings for the switch handle, screws, etc., simply by using the discarded switch plate as the pattern. Place it flat on the new pattern in the proper position and with a scratch awl, or other sharp-pointed tool, trace around the inside of the openings. See Figure 4. The round openings can be drilled out, but the rectangular openings (as in a toggle switch plate) must be sawed out with the coping saw after a hole has been drilled through which the blade can be inserted. In drilling plastics, feed the bit slowly, especially just as the bit goes through the bottom side, and you will get a clean-cut hole every time. A flat or round file, as required, will smooth the inside of the openings. Countersink the screw holes from the front side and fit the new plate to its position on the wall. See that the switch handle moves freely in slot or hole. If the switch plate does not fit flat against the wall, it is probably being prevented by the screws behind it that hold the fixture into the wall box. In that case, remove the switch plate and rout or scrape out sufficient material from the back side to clear the screw heads. Go very carefully on this operation, as the material will be very thin near the countersunk holes. Better make shallow cuts and try several times for a good fit than to cut too deeply once and spoil the job.

Polishing and Surface Ornamenting

After the plate has been properly fitted to its position on the wall and all adjustments have been made, you may proceed to the polishing operations. Refer to page 76 of the February, 1938, issue, and page 170 of the April, 1938, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION for detailed instructions for the sanding and buffing procedure. The plates are buffed to their full gleaming luster before any attempt is made to place a design on the surfaces.

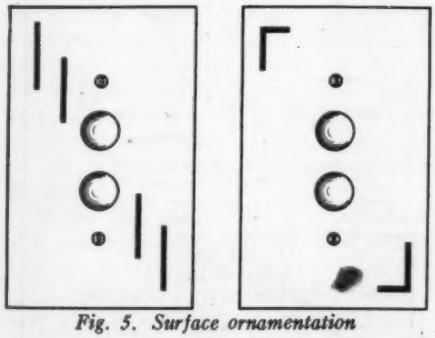


Fig. 5. Surface ornamentation

The designs on the switch plates shown in the photographs were scribed with a sharp-pointed steel awl and then colored lacquers were rubbed into the lines and allowed to dry. Use a straight edge and an irregular-curve rule for smooth lines. For scribing circles or arcs, a steel-pointed compass will do.

Hold the design pattern on the switch plate, and with the point of the scratch awl, prick point the pattern outline at ½-in. intervals or less along all the lines to be scratched. Remove the pattern sheet and rub a piece of colored crayon across the points thus made, and the outline will be more easily seen. Of course, it follows that you must scribe the final lines right through these points for the neatest possible job.

Suggested Shapes for Making a Different Switch Plate

1. The front end of a locomotive.
2. The front view of a radical airplane motor with propeller.
3. The silhouette of some member of the family or friend.
4. The outline of a sailboat.
5. Various shapes such as a star, an ellipse, an oval, a square, a hexagon, or combinations of two or more of these.
6. The regular rectangular-shaped switch plates with ornamental pieces cemented on as shown in Figure 5.

CORRECTION

In the article "Letter Opener of Plastic Material," by J. B. Livingston, which appeared in our April, 1938, issue, reference is made to polishing processes described in the February, 1937, issue of this magazine. This should have been February, 1938.

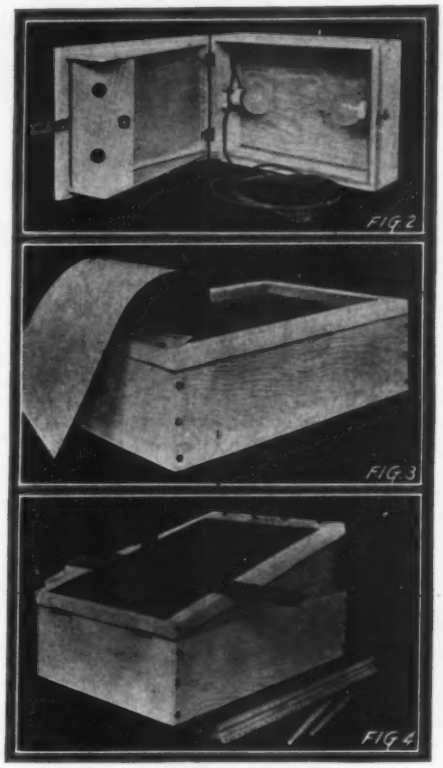
AN INEXPENSIVE MIMEOSCOPE

C. S. Goodman and I. L. Hill,
Marshalltown, Iowa

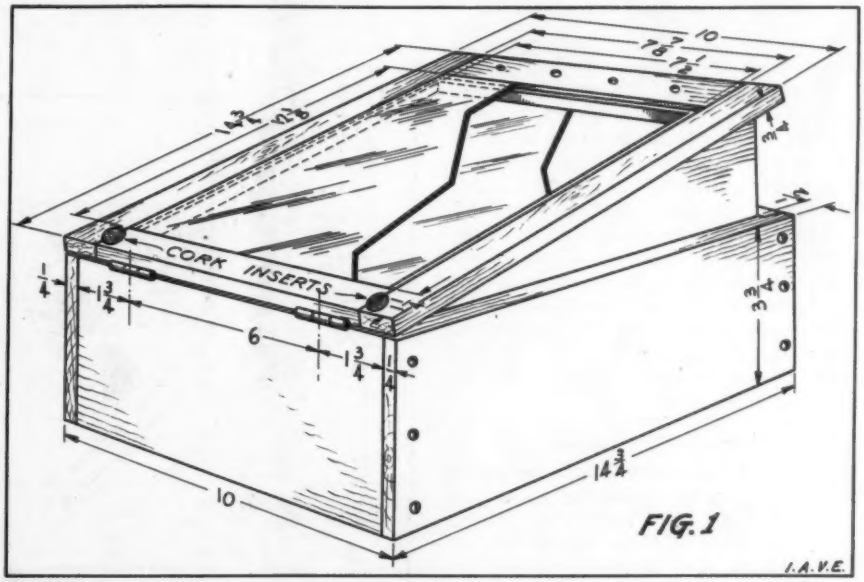
In these days of large classes and decreased budgets, the average teacher of industrial arts has been rather perplexed as to how to conduct his classes without impairing the efficiency of his program. Since it is necessary to give the pupils much information, the teacher must be prepared to duplicate material.

Most schools do not have all of the equipment that is required to do this work in a minimum of time. The writers have found it necessary to devise a "mimeoscope," whereby it is easy to make drawings on stencils for mimeographing instruction and job sheets. The mimeoscope may be used for copy work as well.

The mimeoscope may be made of hard- or softwood. The glass used is double strength, the lower glass being frosted by grinding both sides with No. 100 carborundum powder and turpentine, with pressure



Mimeoscope



Homemade mimeoscope

applied by a flat oilstone. Other methods may be used to diffuse the light, but this has proved to be the most satisfactory. It is very important that one cuts the glass to size before grinding, as it is then impossible for it to break along any given line. The two glasses that are used are ½ in. apart (see Fig. 1) to create a dead-air space, which will prevent the stencil from becoming hot when drawing for a lengthy period. The diffusing glass is held in place by two metal strips which are held securely by screws. The top glass is fastened by three small strips which are held securely by three small brads driven at each end of the glass.

Two bulbs, a 30-watt and a 25-watt, are used as only one makes for a bright spot in the center of the stencil. The 25-watt bulb is located at the hinged end of the box. The lights are wired in parallel and a cord about 9 ft. long is desirable.

The panel O (see Fig. 2) is hinged to the frame. When the top is elevated, the panel wings down and rests on two screws which are in line with the top of the porcelain socket. A triangular panel is also mounted on each side in order to prevent the light leakage. The stencil is held to the frame by hooking it over the four screws at the top and by two thumb tacks at the bottom. To avoid having to punch too many thumb tack holes, two small corks have been glued into the hinged corners of the frame. The extension cord passes out between the frame and the box.

When not in use, the T square, the triangles, the stylus, and the cord may be placed in the box, panel O swung up against the glass and the lid closed. This makes the box very compact and convenient to handle, and the instruments are at hand when needed, as in Figure 3.

Figure 4 shows the mimeoscope in use.

MODERNISTIC SMOKING STAND

W. C. Bohnsack, Steuben Junior High School, Milwaukee, Wisconsin

The smoking stand here pictured is an excellent problem for the metal class. It involves peening, cutting, drilling, lathe work, tapping threads, piercing and spinning or beating down. A further experience may be added by having the boys etch some design or initials in the copper matchbox holder or tray.

It has met with a great deal of success, and the design readily appeals to the boy. There is little chance of failure as all bends are made at angles which are much easier for the boys to execute than irregular curves.

The simple design, rugged construction, variety of operations, and utility of this project make it an excellent project for the high-school metal shop.

Method of Procedure

1. Peen and cut stock to length. Use either ball or cross peen for peening the stock:

3 pcs. ⅜ by ⅜ by 11 in.
3 pcs. ⅜ by ⅜ by 5½ in.
3 pcs. ⅜ by ⅜ by 4 in.
3 pcs. ⅜ by ⅜ by 2½ in.
3 pcs. ⅜ by ⅜ by 1½ in.
18 pcs. ⅜ by ⅜ by 5/16 in.

2. File or grind ends smooth.

3. Heat and bend 11-in. pieces to shape.

4. On a 4-in. piece, measure ⅞ in. from ends, and center punch and drill a 13/64-in. hole. This drilled piece may then be used as a jig in drilling the other two 4-in. pieces and the three 5½-in. pieces.

5. In drilling the 5½-in. pieces, place all three pieces in the drill-press vise at the same time. On top of these pieces place the drilled 4-in. piece so that it is in the middle. Tighten the vise and using the holes in the 4-in. piece as guides.

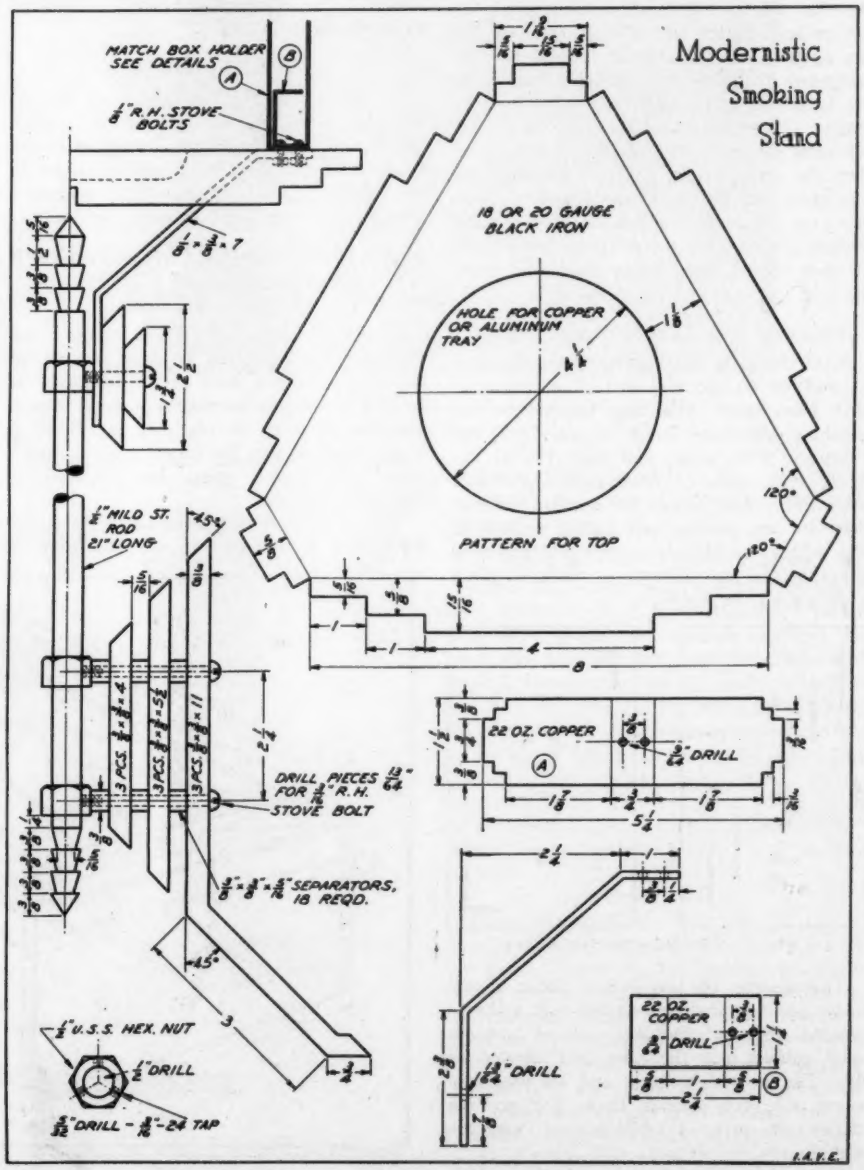
6. The drilled 5½-in. pieces may now be used as jigs in drilling the bent 11-in. pieces. Place all three 11-in. pieces in the drill-press vise at the same time so that they are side by side with the bent parts up. Should there be any variation in the lengths of the 11-in. pieces, be sure the bottom ends are even. On top of these in the proper position, place the 5½-in. pieces so the drilled holes are in line. By using the pieces as jigs, the time in laying out and center punching each piece separately is saved. The possibility of getting the holes unevenly spaced and causing trouble in assembling also is eliminated.

7. Center punch and drill 13/64-in. holes in 5/16-in. pieces.

8. Center punch and drill 13/64-in. holes in center of 1¾-in. and 2½-in. pieces.

9. Drill out threads in ⅜-in. hex nut with ½-in. drill. On every other side, that is on three of the sides, center punch and drill a 5/32-in. hole. Tap for 3/16–24 stove bolt.

10. The rod or shaft is made of ½-in. round mild steel. Place in three-jaw universal chuck on lathe, and file off scale, and file in designs for top and bottom. Polish with emery cloth.


Modernistic Smoking Stand
MATCH BOX HOLDER SEE DETAILS
⅜" R.H. STOVE BOLTS
18 OR 20 GAUGE BLACK IRON
HOLE FOR COPPER OR ALUMINUM TRAY
PATTERN FOR TOP
½" MILD ST. ROD 21" LONG
22 OZ. COPPER
DRILL PIECES 13/64" FOR ⅜" R.H. STOVE BOLT
⅜"-⅜"-⅜" SEPARATORS, 18 REQD.
½" U.S.S. HEX. NUT
½" DRILL
⅜"-24 TAP
I.A.V.E.

Designed by W. C. Bohnsack, Milwaukee, Wisconsin

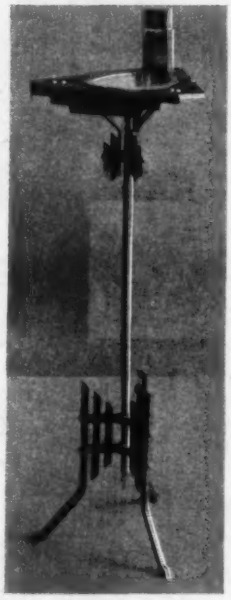
11. Supports for the top are made of mild steel ⅛ by ⅜ by 7-in. Peen and bend to shape. Lay out and drill holes.

12. Cut out top and bend to shape. File off any sharp edges.

13. Cut out and form matchbox holder.

14. To give contrast to the peened pieces, they are heated, dipped in oil, and then put back into the furnace to burn off the excess oil. This puts a good black finish on the metal. Then if the pieces are rubbed with emery cloth a nice contrast between the high and low spots can be obtained.

15. Assemble pieces for base. Use 3/16-in. r.h. stove bolts. The bolts will extend inside the ½-in. hole that has been drilled in the nut. These bolts must be cut flush with the inside of the ½-in. hole. To do this, com-



pletely assemble the bottom. Then with a coping-saw blade through the two nuts saw off any part of the bolts extending into the hole. Next loosen each bolt approximately one-fourth turn and with a round file, file off any remaining part of the bolt so the ½-in. shaft will slip through. Now if the bolts are retightened they will extend into the nut enough to pinch and hold the shaft securely in place.

16. The part holding the top is assembled and fastened to the shaft the same as the two bottom nuts.

17. Drill holes in the top for the braces. Drill 9/64 in. and use ⅛-in. roundhead stove bolts.

18. Assemble all pieces for the top.

19. Warm and wax entire stand. Allow to cool and polish with soft cloth. The stand may be lacquered with clear lacquer instead of waxing.

The Tray

The tray is made of 18-oz. copper and is from 5 to 6 in. in diameter. Aluminum or brass also may be used. The well or sunken portion must be made to fit the hole in the top of the stand. The depth may vary from ½ to ¾ in. The form is made of 2-in. birch or maple that has been turned to give the desired size tray. The form may be used if the tray is to be beaten down with a mallet, or it may be fastened to an engine lathe faceplate and used to spin the tray to shape. Spinning is by far the quickest and most fascinating method. In using this type of form it is not necessary to have a spinning center or thrust bearing. Figure 1 shows the form on the faceplate without the metal attached. Figure 2 shows the partly spun tray. The tool is nothing more than a piece of hardwood 1 in. square and approximately 20 in. long. The tool post and tool holder are used as the rest.

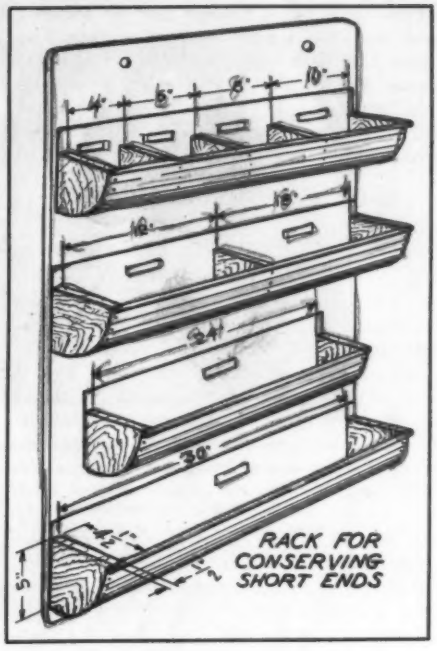
Very briefly the steps in forming the tray by spinning are:

1. Cut a 5-in. square of metal desired (assuming 5-in. dia.).
2. Anneal metal.
3. Place over tray part of hardwood form and fasten to form. If tray is to be deeper than half inch, it is better to fasten with round-head screws as it will require more than one annealing.
4. Fasten form and metal to faceplate and bring up carriage of lathe so the tool post and tool holder may be used as a rest.
5. Dip the end of the tool or stick in lubricating oil and bring it into contact with revolving stock. Using the tool post as a fulcrum and working from the center out, the metal may be made to take the shape of the recessed form. When the metal has reached the desired shape it may be polished with steel wool.
6. The round tray is cut from the square stock by bringing a diamond-point cutting tool against the stock. This gives a perfect circle without any trimming. File off the sharp edges and the tray is finished. The diamond-point tool may be made from an old file.

RACK FOR CONSERVING SHORT ENDS

C. K. Lush, Industrial-Arts Assistant, Minneapolis, Minnesota

The rack illustrated here will be found useful for saving short ends of various types of material for future use.

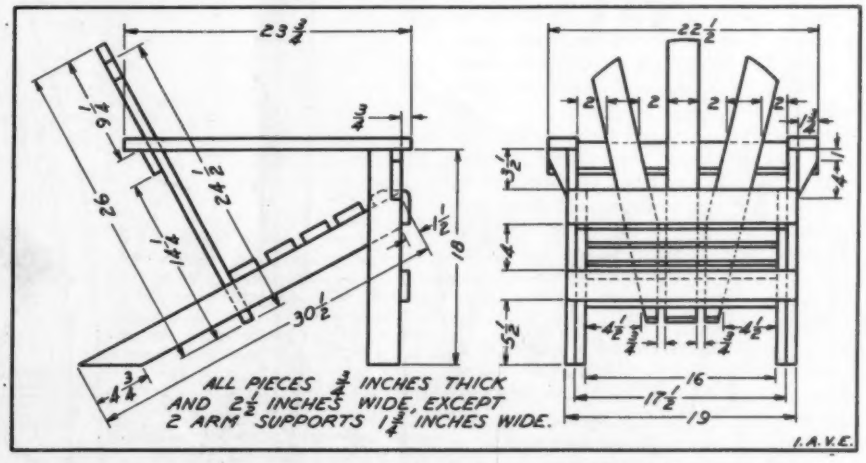


In the electric shop, for instance, it will save a great deal of solid rubber-covered or annunciator wire. The rack may be kept in the tool and supply room. At the end of each period, students straighten out the wire which they used on their completed wiring jobs. The boy in charge of supplies separates the pieces according to lengths and places them in the appropriate bins. When a student asks for wire of a given length for a job, these pieces are used before more is cut from the large roll.

One rack for rubber-covered and one for annunciator are better than mixing the two in the same rack.

The rack is also very convenient for storing dowel rod or airplane supplies in the woodshop or lead strip rules in the printshop.

A piece of 3-ply fir veneer, ¼ by 34 by 32 in., is sufficiently sturdy for the back



Lawn chair designed by Willard H. Davis, Tourtellotte Memorial High School, North Grosvenordale, Connecticut

of the rack. Label holders may be soldered over each bin for the description tags. The sides are made of light sheet-metal strips about 8 in. wide. A wired-edge or double-fold hem may be formed along the front edge. If metalworking equipment is not available, gutters may be used for the bins.

A GARDEN REFRESHMENT TRAY

Osma Couch Gallinger, Hartland, Michigan

This jaunty-looking basket tray on its canelike support offers a novel and convenient method of serving cool drinks on the lawn. The wooden rod, sharpened at one end, is put through an opening at the center of the tray. The pointed end may then be pushed down into the soft turf at any convenient spot, to make a temporary table. The tray holds two large or four small glasses.

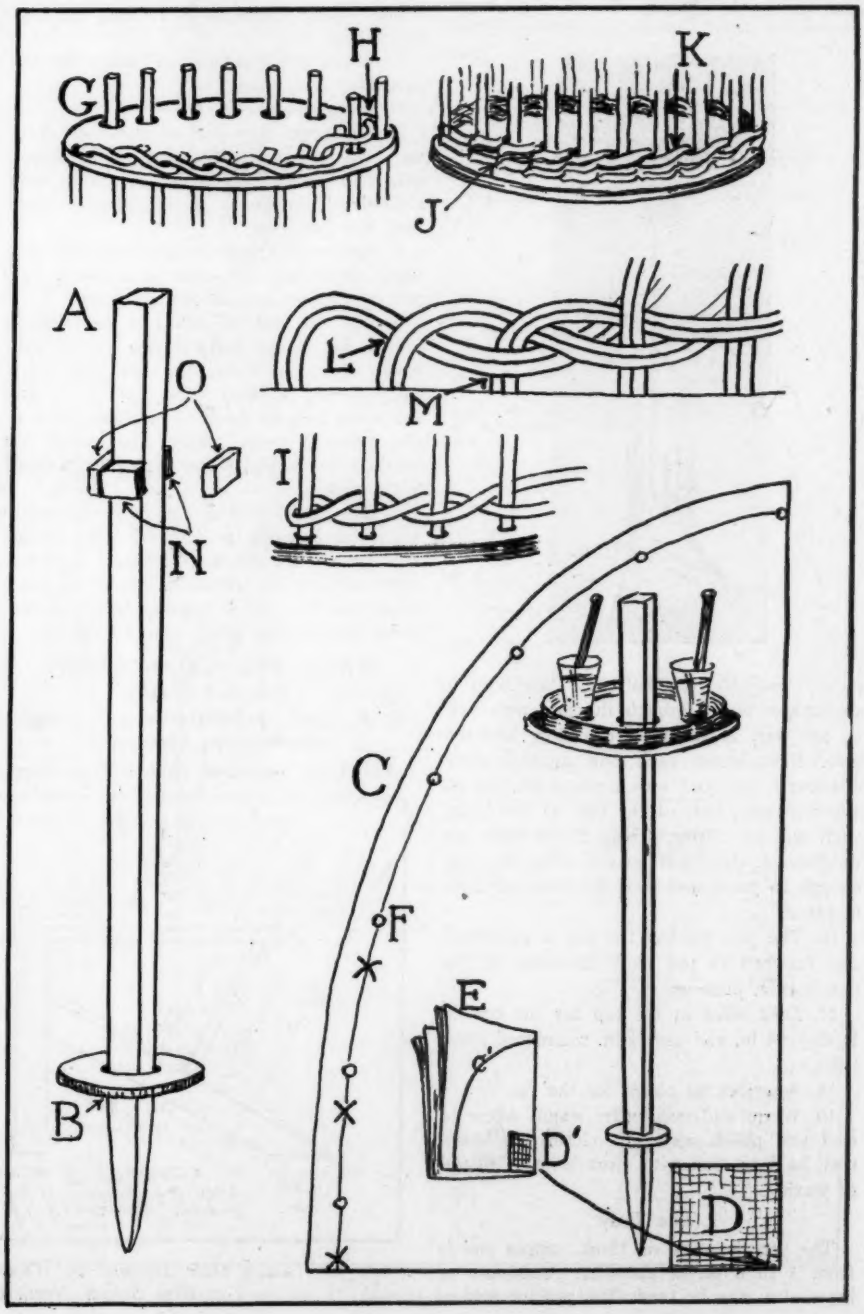
The Rod. This consists of a stick of white pine or cypress, 1½ by 1½ by 30 to 36 in., as shown at A. Start tapering it 18 in. from the base by using a plane. When the rod tapers to a point, round all edges and sandpaper smooth. To balance the refreshment tray at its base, cut a circle of wood 5 in. in diameter as shown at B. Bore a hole 1¼ in. in diameter at its center. Then push this up over the rod until it is snug. Fasten with brads tacked into the rod just under the circle.

The Tray. The correct elliptical shape for the tray is shown at C, where a full-size, quarter pattern is given. One fourth the opening at the center of the tray is shown at D. To make a pattern of the entire ellipse, fold a paper over twice, as at E, lay pattern C across the corner, trace outline, cut, unfold. Also cut corner D out of folded corner of paper. Trace the ellipse on veneered or beaver board ¼ in. thick. The final ellipse is 9 in. long and 5½ in. wide. Use a coping saw for cutting out the tray. At its center, where square opening is to be, bore a hole 1¼ in. wide, then cut this hole square on the line, to fit over the rod 10 in. from the top. Then sandpaper all edges smooth. Next, bore ⅛-in. holes for the tray spokes. Put the holes indicated by circles on the first half of the ellipse, and space them as shown by the crosses on the other half. This will make an uneven number of holes around the tray.

Weaving Tray. Cut the ⅛-in. spokes into 12-in. lengths. Soak them until pliable Insert them into the holes as shown at G. Turn the tray upside down, and bend each short spoke in front of the spoke end at its right, then back of the next end and to the inside, as at H. Repeat this all around, and then turn the tray right side up. For weaving the upper edge, double a No. 2 weaver, 1/16 in. in diameter, around a spoke, as at I. Weave around tray with pairing weave, always twisting the left one of the two ends over the other end and in between the next two spokes as shown. Weave four rounds, as at J. If you prefer simple weave, use only one weaver and weave under and over the spokes for four rounds.

Border. To make the double border shown at L and M, insert extra spokes beside first spokes, as at K. Soak spokes until pliable by holding the inverted tray over water. Carry each pair of spokes under the pair at its right, as at L, over the next pair, as at M, and to the inside. Proceed with each pair next at right. Insert last pair in proper opening next to first pair.

Fastening the Rod to the Tray. To brace the tray securely in its place, cut two narrow pieces of wood, N, same width as rod, and two other pieces, O, long enough to cover ends of N pieces when nailed at either side of rod. Insert rod through opening just before nailing bracing pieces in place Use glue and brads to make it secure.



TRANSPARENTIZING FORMULAS

Shop teachers who want to make blueprints of drawings inked on heavy paper may find the following transparentizing formulas useful.

Mr. Harvey W. Waffle, High School, Waukesha, Wis., submits the following: 4 oz. banana oil, one 10-cent tube white vaseline. Mix the two by heating slightly. Keep in stoppered bottle. The banana oil furnishes a quick drier, and the vaseline the permanent oil. Oil side of paper turned toward the light.

Mr. Joseph Munce, Highland Park, N. J., has this to suggest: 10 per cent Canada balsam and 90 per cent Benzol. This solution is rubbed on the back of the sheet, and dries out.

Lazy Squaw Stitch Coiled Grass Baskets

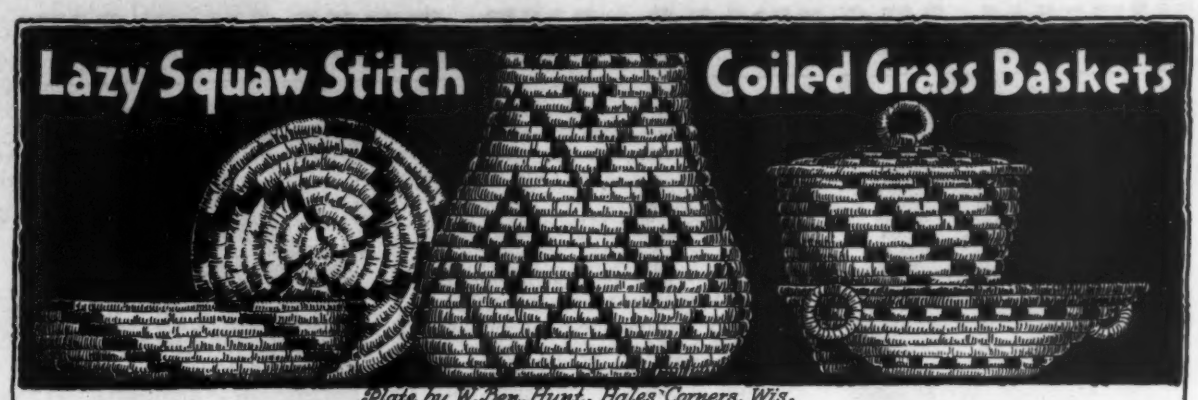


Plate by W. Ben. Hunt, Hales Corners, Wis.

The coils of these baskets are made of long-bladed grass such as marsh or sword grass, which should be cut in mid-summer, and carefully laid out in a shady, well ventilated place until thoroughly dry. To use, it is first immersed in water until pliable and then laid between wet cloths from which it is taken as needed.

Raffia, which can be purchased at florists or basketry supply houses, is moistened the same way. If the materials become too dry while working, dip your hand in water and moisten the materials by running your hand over them. When work is laid aside for the day, hang it up where it can dry or the grass may get moldy. When starting work again, moisten entire basket.

Blades of sword grass are usually from 3 to 4 feet long.

1 When both materials are moistened as explained above, take a bunch of grass the thickness of a pencil and start wrapping (at the butt ends) with raffia as shown below Fig. 1

Fig. 1.

2 Wrap firmly for about 1½ to 2 inches, working it into an arc as shown in Fig. 2.

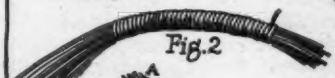


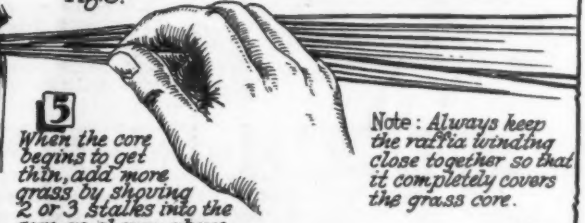
Fig. 2

3 Twist into a tight coil and sew with a large darning needle as shown in Fig. 3, pulling the raffia as tight as possible. Then wrap around 4 or 5 times and sew it around the previous coil, etc. The ends at A are cut off flush

Fig. 3

4 Method of holding while wrapping and sewing to insure a tight, firm basket.

5 When the core begins to get thin, add more grass by shoving 2 or 3 stalks into the core as shown above, concealing the ends. A turn or two of wrapping will hold them.



Note: Always keep the raffia winding close together so that it completely covers the grass core.

6

Fig. 4.

When raffia gets too short, pull it thru the core and cut it off, leaving about an inch projecting. Fig. 4.

Start new binder as shown in Fig. 5, letting an inch of it extend. Lay both ends along the core and wrap around them to fasten them.

Fig. 5.

7 Hot pads can be made by coiling flat to the desired dimension, from 5 to 8 inches in diameter. They may be ornamented as shown in second illustration at top of page. This is done with colored raffia. The white raffia is given a couple of turns over the space that the color is to cover. The colored raffia is then wrapped around and the same is done with the end as before

Neither of the binders need be cut for this pattern. For some patterns the ends are secured as in Fig. 4 & 5.

Fig. 6.

8 End of coil is gradually tapered off to make a make a nice even edge in finishing a pad or basket.

9 When making a basket, the bottom is made like a hot pad, but instead of a tapered ending, the coil is worked upward to form the sides. Fig. 7. The shaping of the basket is a matter of individual taste and is governed by the eye of the worker.

Fig. 7.

Bottoms of deep baskets need not be decorated.

Colored raffia may be used to ornament baskets. For some designs, the colored raffia will have to be cut, but if possible run it along the core and cover with the white and vice versa. Fig. 7.

Finish top edge of basket as shown in Fig. 6.

10 Ring handles can be made by winding a couple of stalks of grass in a circle and wrapping it with raffia. Fig. 8.

Sew handles to basket with raffia.

Ring Handle

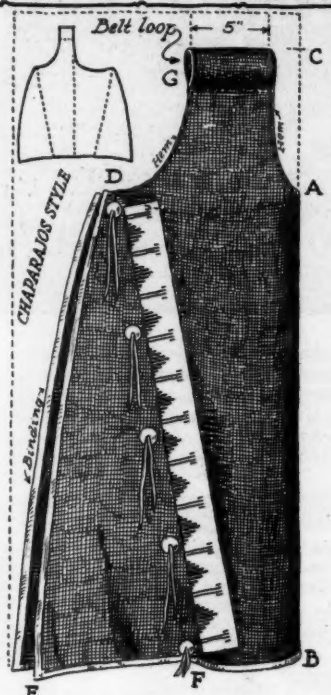
Fig. 8.

When colored raffia cannot be obtained, it can easily be colored with any of the cloth dyes on the market.

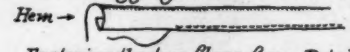
11 To make a cover fit snugly, it should have a flange to fit the inside of the basket. Make ring as shown in Fig. 8, and sew it to the underside of the cover with raffia.

INDIAN LEGGINGS AND BREECHCLOUT

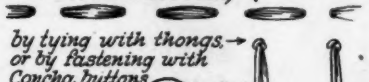
PLATE BY W. BEN. HUNT. — HALES CORNERS, WIS.



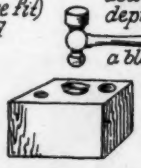
The Indian used whatever material was on hand. When game was plentiful, buckskin was used for all clothes. Later he used blanket cloth. Leggings may be made of buckskin if you have it or of split cowhide of a cream or gray color such as is commonly called glove leather. Dark blue broadcloth is ideal but rather expensive. Outing flannel is often used but should be a good quality. A good grade of dark blue denim will make dandy leggings and is inexpensive. The cheapest material of all is two new grain bags without printing on them. Dye them a dark, navy blue color. Any boy can do it by following the directions on the dye package. Rip open the sewing before dyeing. Use silk ribbon, bias binding, or 1-inch or 1½-inch strips can be cut from bright red or yellow cloth. You probably can get someone to sew the binding on with a sewing machine. If you are using leather, the edges D-E should be fringed. Upper part of cloth leggings should be hemmed.



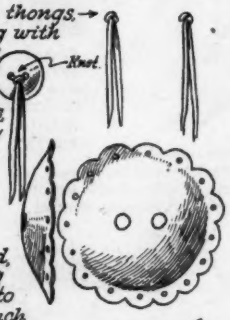
Fastening the two flaps from D to F may be done by sewing, by lacing with a buckskin thong, (holes in cloth are made with an awl)

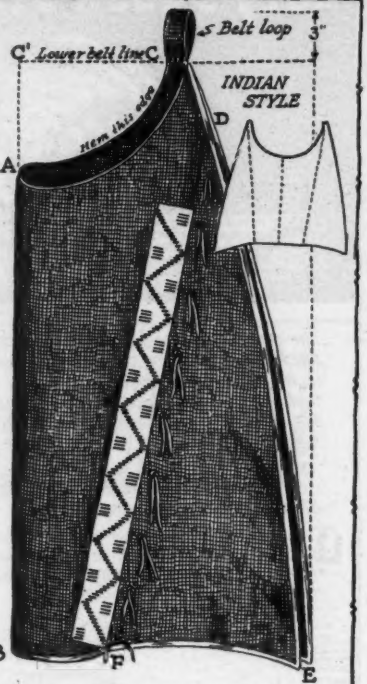


by tying with thongs, or by fastening with Concha buttons. These can easily be made of copper, brass, pewter or heavy tin by hammering the metal down into a depression in



a block of wood, and filing the edges to shape. Punch holes for tying



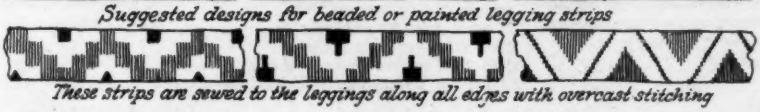


Measure before buying material.
C - Upper belt line.
A - Crotch.
B - Ankle.
D - Hip.

From C to B plus 4 inches will give length of material for one legging.
Material is usually 36 inches wide.
Fold and mark with chalk from A to D at crotch, from B to F at ankle (loose fit) from A to C as shown, and from D to G as shown.
Make flaps D,E,F about 8 or 10 inches wide at bottom (from F to E)

C - on this pattern is the lower belt line
C to B is the length of material for one legging.
Measurements are same as at left except at A-C
Measure from C' to bottom of crotch to determine where to start cutting at A
Material for loop is taken from waste and is sewed on after legging proper is finished.
Before doing any sewing, it is good policy to pin them together and try them on, or do it with one and then cut the other one from that. Remember - one is left and one is right

Suggested designs for beaded or painted legging strips



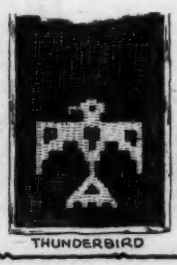
These strips are sewed to the leggings along all edges with overcast stitching

Legging strips are usually beaded but they can also be made of strips of canvas carefully painted with bright colored enamel

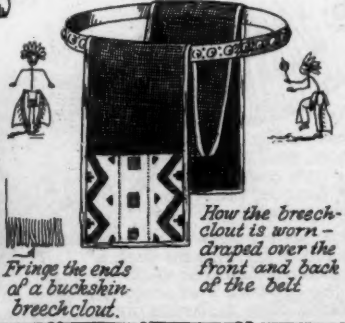
BREECHCLOUTS *are strips of soft cloth or buckskin 1 foot wide and 6 feet or more in length. If made of cloth, the edges are bound with red or yellow tape. The ends are often beaded or sometimes the front end only is beaded. The beads are sewn right onto the cloth. Black cloth makes a wonderful background for beadwork.*

Note: A breechclout may be worn without the leggings but it must be worn with them. Yes sir.

APACHE DESIGN



THUNDERBIRD



Fringe the ends of a buckskin breechclout.

How the breechclout is worn — draped over the front and back of the belt

BRAD DISPENSER

Jos. J. Lukowitz, Milwaukee, Wisconsin

Brads and nails are not costly, but if boys are allowed to waste them, habits of wastefulness may be formed which might prove costly in later life. A teacher may save brads and nails by edict but this method is often unpleasant for teacher and pupil.

Various methods and devices have long been used to keep brads available for class use. Small glass bottles, such as salad dressings are sold in, are frequently used by teachers as brad containers. Because of the visibility afforded by the glass these bottles are excellent for the purpose. However, when the boy removes the cover to obtain brads he usually takes several times as many brads as his work requires and he then, all too often, sweeps the remaining brads onto the floor at clean-up time.

This wasteful tendency can be curtailed by simply punching a ⅜-in. hole in the cover. The hole may be punched with a center punch. The burr on the inside of the cover should be hammered down flat so that it does not retard the brads from sliding out. Brads from the very shortest to those 2 in. in length may be dispensed in this way.

To use the dispenser, tilt the bottle back and forth as shown. The brads will be more readily emitted if the bottle is not filled more than about half.

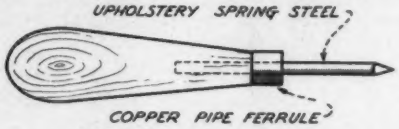
SMALL TOOLS MADE IN THE SCHOOL SHOP

Stanley Mythaler, State Teachers College, Valley City, North Dakota

We have made a large number of these small tools in our general shop, and the junior-high-school boys were interested both in making and in using them.

Scratch Awl

The handle of the scratch awl shown in Figure 1 is turned from scrap wood on the lathe. The ferrule is made of ½-in. copper pipe. It is well to let the wood project a little beyond the ferrule. Finish with sandpaper and file. Drill a hole for the steel point by using a drill chuck in the live center and centering the butt of the handle on the dead center, or using a cone-shaped centering tool in the dead center. Straighten the

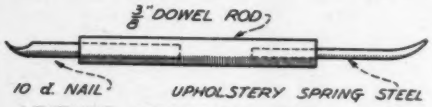


SCRATCH AWL - FIG. 1

wire of a heavy-coil upholstery spring and cut the pieces to the proper length on a grinder. This wire is too hard to saw. Insert the wire and point.

Leather Modeling Tool

The tool shown in Figure 2 is made of a piece of dowel rod, a piece of upholstery spring, and a section of a 10d nail. Cut and drill the dowel rod first. Point the ends



LEATHER MODELING TOOL - FIG. 2

slightly in a pencil sharpener if desired. Shape the end of the nail on the grinder and file to a spoonlike surface for embossing. Grind and bend the end of the spring steel, cold.

Screw Driver

The small screw driver shown in Figure 3 is made of steel salvaged from old upholstery springs. Bend this to the desired shape, cold, then grind the edge. These are about the size of the average sewing-machine screw driver.

SCREW DRIVER - FIG. 3

Razor-Blade Knife

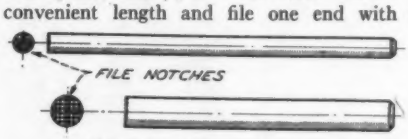
Cut the wood handles out of hardwood about ⅛ in. thick. See Figure 4. Use single-edge blades that are notched at the end.

RAZOR BLADE KNIFE - FIG. 4

Loosen one screw and reverse ends when the front corner is dull. These knives are handy in leatherworking, chip carving, and linoleum-block cutting.

Background Punches

These punches may be made of 10d nails, 16d spikes, and ⅜-in. mild steel. Cut to a convenient length and file one end with a



BACKGROUND PUNCHES - FIG. 5

three-cornered file. See Figure 5. These punches are very useful for stamping the backgrounds in leather-work and in wood carving.

Answers to Questions

FINISHING COPPER

1011. Q.: Kindly tell me how to finish polished copper so that it will not tarnish. What can I apply to it to preserve it? Then, where can I get enamels for crackle finishes, and how are they applied? — *R. S. F.*

A.: The polished copper should be well cleaned in hot water containing about 4 oz. of tri-sodium phosphate per gallon of boiling water. Follow this with a rinse in clean hot water. Wire with soft copper wire or cotton string so that the hands will not touch the work at all, or finger spots will develop later.

Let dry thoroughly without handling, then spray on a clear metal lacquer made especially for copper or silver. It may also be applied by dipping, if properly reduced with a thinner supplied for that type of lacquer. Do not make the serious mistake of thinking that any lacquer will do the job on copper.

While crackle finishes are distinctly "out" in both the furniture and metalworking trades, they require baking equipment for their successful application, and hence are not recommended to shop use.

In case you want to go into the matter further, you can write to Pratt & Lambert Co., Buffalo, N. Y., or Murphy Varnish Co., Newark, N. J., both of whom can give you the materials needed. — *Ralph G. Waring.*

SEASONING TREE TRUNKS

1026. Q.: What method is used to season wood so that the bark will stay on? — *U. G. W.*

A.: Cut the cedar trees or hickory trees when the sap is down, i.e., in the middle or late winter. No other method or time of cutting will have the least influence on the adhesion of the bark. — *Ralph G. Waring.*

FINISHING PHILIPPINE MAHOGANY

1027. Q.: We are using some Philippine mahogany for woodshop projects this year. Kindly give us your advice as to the best methods of finishing this wood. We have Grand Rapids water stains and fillers, and would, of course, like to use them. Pieces will be varnished and rubbed. — *C. H. D.*

A.: You may use Philippine mahogany as you term it, with entire assurance as to its being a most satisfactory wood for any furniture job. For your information, the Interstate Commerce Commission has ruled that the

wood must now be called by its correct term "Luan," or "Red Luaan," since it has none of the characteristics of genuine mahogany except its color, and this ranges from white to black-brown.

As a furniture wood, however, it is very fine indeed, the only criticism that the trade brings against it is the fact that some grades have such coarse pores that they need double filling. It is now being used in such quantities as to have seriously cut into the trade for genuine mahogany.

A specification for finishing this wood would be:

1. Sand the cabinetwork free of glue and scratches. Sponge and let dry. If any black stains appear from hands, glue, or iron clamps, bleach out with a 4-oz. solution of oxalic-acid crystals in hot water. Dry 12 hours and resand.

2. Stain with a standard water stain, reduced as desired for the color match. Dry 12 hours in a warm room.

3. Brush or spray on a sealer coat of shellac and shellac-mixing lacquer to correspond with a 1-lb. cut of shellac.

4. Dry until hard and sand with a split No. 6/0 or 4/0 paper.

5. Make up a filler on a silex base of the color desired and carrying 14 lb. of paste base per gallon of thinner which should be made from one part of turps and two parts of standard gasoline. Brush on heavily with the grain, let set until the gloss begins to flat off and then wipe off the filler with a wide cloth pad in circular sweeps. Clean off thoroughly with fresh cloths and use a picking stick in all corners, moldings, and carvings. Let dry not less than 24 hours. Inspect for level filling and if not satisfactory, refill; dry another 24 hours. Inspect carefully for filler smudges left inadvertently in close corners and panels. Remove with a flat cloth pad slightly dampened with gasoline-turpentine thinner. Dry at least an hour.

6. Spray or brush on a sealer coat as in No. 3. Dry at least 3 hours in a room, heated to a temperature of 75–80 deg. F. Sand with old split No. 6/0 paper. Do not discard partly used split papers since they do a wonderful job of sanding turnings and other parts which have been sealed.

7. Dust off and varnish with a good 4-hour floor varnish. Dry overnight. Sand with split No. 6/0 and revarnish. Dry 24 hours.

8. Water-sand with No. 4/0 Speed-wet paper. Dry two hours and revarnish. Dry four days.

9. Water-sand with No. 6/0 and oil-rub with FFF pumice stone, felt pad, and crude oil. When the rubbing is completed, leave on the rubbing sludge, dip a large pad of clean white cotton waste in water and use to rub the work to a final surface. Do not use any fresh pumice. Wipe clean with waste and polish with clean cloths. — *Ralph G. Waring.*

ATTENTION, PLEASE

The September, 1938, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION will be mailed to its readers on the 15th of August. Please notify us promptly if you are going to change your address on or before that date.

Personal News

¶ MR. LYNN A. EMERSON, assistant superintendent of schools, in charge of vocational education, is leaving Yonkers, N. Y., to take up a position at Cornell University, Ithaca, N. Y. Mr. Emerson will assume his new duties during the summer session.

¶ MR. JOSEPH WILLIAM SLYVA was elected a teacher of industrial arts at the Weeks Junior High School, Waltham, Mass.

¶ MR. HAROLD T. WIDDOWSON, for the past seven years State Supervisor of Trade and Industrial Education for the State of Minnesota, will be associated with Dr. Homer J. Smith, at the University of Minnesota. In his capacity as Assistant Professor of Industrial Education, he will help Smith-Hughes teachers, co-ordinators, school superintendents, and educational boards. He will also conduct foremanship conferences and will assist the industrial-education movement in any way that may present itself.

¶ MR. L. E. FALGREN has succeeded Mr. A. L. Guy as supervisor of industrial arts at Kansas City, Kans.

¶ MR. F. E. TUSTISON has been made an honorary member of the Eugene Field Society, a national association of authors and journalists organized to perpetuate the name of Eugene Field.

¶ DR. WILLIAM E. WARNER has been appointed editor-in-chief of the new series of books "Arts and Industries," published by the International Textbook Co., Chicago, Ill. The first texts of this series have already been released, and include *Science Experiences with Home Equipment* by Lynde, and *Costume Design* by Carolyn Bradley.

News Notes

¶ The Carnegie Institute of Technology, Pittsburgh, in its 1938 summer session, is offering a wide variety of courses in shop subjects. Among these are woodworking, printing, sheet metal, art metal, welding, machine-shop practice, forging, and ornamental iron work. Courses in psychology, education, mechanical drawing, and general subjects will also be offered.

A comprehensive schedule of subjects is offered by the department of printing. Courses in hand composition, typography, lettering, advertising design, book design, linotype, platen and cylinder presswork, and printing-plant management are being provided. A course in photo-lithography will be offered for the first time this year. Other courses include architecture, drama, music, painting and design, sculpture, psychology and education, and engineering and general subjects.

¶ Under the WPA program, the New Haven Aviation Club School will graduate some 50 students who have completed their primary course in aeronautics. The course was prepared by Lt. Col. Victor Page, who has long been associated with the U. S. Army.

¶ The Springfield, Mass., School Committee has rented space in the King Auto Paint Shop, in Chicopee Falls, for Trade School classes in electric welding. Mr. William C. Curran of Weymouth has been appointed as day-school instructor.

¶ The Emporia, Kans., school board voted to start a vocational agriculture course in the Emporia High School for the coming year.

¶ A unit trade school and placement service have been established in connection with the vocational department at Greenfield, Mass. Under the new program, a centralized placement service has been established for pupils in the senior high and vocational schools. In the junior high school, the work periods have been scheduled to permit the assignment of definite subjects under subject teachers in place of the former study periods.

¶ A successful class in window display is being conducted in Chanute, Kans., under the direction of Mr. Harry Rhodes.

¶ Plans have been made for the organization of evening classes for oil-field workers at Great Bend, Kans. The action was taken following a talk given to 55 oil-field workers by Mr. Laurence Parker early in January. The classes are being organized with the approval of Supt. H. C. Scarborough.

¶ At Arkansas City, Kans., a variety of evening courses has been introduced, including blueprint reading, plan reading for carpenters, electricity, show-card writing, blueprint reading for metalworkers, and petroleum refinery practice.

¶ A monthly lecture series has been started by the Department of Publishing and Printing of the Rochester Athenaeum and Mechanics Institute, Rochester, N. Y. Mr. Douglas C. McMurtrie, of Chicago, spoke on "The Modern Approach to the Design of Printing."

¶ A dinner for the entire class in diversified occupations and their guests was held by the Georgetown Future Craftsman Club. Georgetown, Texas, boasts of the oldest and most successful program of diversified occupations in the state.

¶ The influence of science and engineering on the modern arts will be the subject of an international symposium at the Massachusetts Institute of Technology next June. The symposium will take up the obvious applications of industrial design and the intangible and subtle effects of science on music and other art forms. Supplementing it will be an exhibit of industrial arts in which the work of leading designers will be shown. The symposium will consider two schools of thought, namely, the point of view of the older group of artists, and the philosophy of the younger school of industrial designers. The exhibit will present objects representing art from the machine in various forms.

¶ Evening courses have been established in the Department of Publishing and Printing of the Rochester Athenaeum and Mechanics Institute, Rochester, N. Y., with an enrollment of more than sixty printers. Among the courses to be offered between now and July 1 are hand composition, presswork, linotype and intertype operation, linotype and intertype maintenance, monotype caster operation, and layout and design.

¶ One of the significant features of the building program approved by the New York City board of education is that out of fourteen projects for secondary schools, eight are for vocational schools, and six are for academic high schools. The indication is plain that an increasing portion of new plants for secondary education will be devoted to vocational training.

¶ At the recent meeting of the Norfolk County School Board Members Association meeting, held at Milton, Mass., Dr. Robert O. Small, director of the Division of Vocational Education of the State Department, gave a talk on "Vocational Education."

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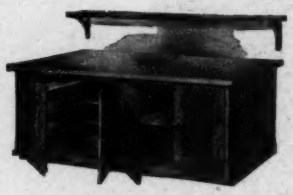

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New Publications

Aluminum

By Douglas B. Hobbs. Cloth, 295 pages, 9¼ by 6¼, illustrated. Price, $3. Published by The Bruce Publishing Company, Milwaukee, Wis.

This book was written by a man who has had a long and intimate association with the aluminum industry. To him the writing of the history of aluminum was a labor of love. His preparation for the engineering profession and his practical knowledge of metallurgy are an assurance of the correctness of the technical portion of the subject contained in Part I. His ability as a writer has made the whole a very interesting contribution to the related-subjects material in the metalworking field. Part II consists of 25 detailed projects which, with their descriptions, bills of materials, and rich illustrations, will captivate and interest anyone who is attracted by fine metalwork.

Mathematics for Shop and Drawing Students (225 pages. Price, $1.60).

Mathematics for Electrical Students (225 pages. Price, $1.60).

Technical Mathematics (Vol. I, 246 pages. Price, $1.25. Vol. II, 277 pages, price, $1.50. Vol. III, 148 pages, price, $1.25).

By Harry M. Keal and Clarence J. Leonard. Cloth, 7¼ by 5, illustrated. Published by John Wiley & Sons, Inc., New York City.

This series of books is designed for industrial workers and shop students who need a practical and workable knowledge of algebra, geometry, and trigonometry.

This material contains many practical applications to the fields for which the individual books are intended. The authors particularly emphasize that the books are to be looked upon as texts and not as general-instruction books for the fields for which they have been written.

These books also may be used for individual and self-instruction.

How to Drive

Paper, 112 pages, 9 by 6, illustrated. Published by The American Automobile Association, Washington, D. C.

This is one of the pamphlets belonging to the "Sportsmanlike Driving Series." It contains excellent material for the beginning driver and for students in the safe-driving classes. The booklet contains 7 chapters which take up the following topics: Learning to Drive, Before You Start the Engine, How the Automobile Runs, Action!, Maneuvers, "Solo Driving," and Giving the Car a Square Deal.

A list of subjects for discussion, project assignments, and a bibliography have been added at the end of each chapter.

Air Conditioning Furnaces and Unit Heaters

By J. Ralph Dalzell. Cloth, 430 pages, 8½ by 6, illustrated. Price, $2.50. Published by The American Technical Society, Chicago, Ill.

A well-illustrated, comprehensive textbook on this important new and yet old subject. The installation of air conditioning equipment in both old and new houses is discussed and the principles of engineering, operation, and selection of typical air conditioning apparatus are fully covered. There also are house plans with step-by-step directions covering the design and installation of air-conditioning systems.

The large psychometric chart, which will be found useful in solving the problem on heating and air conditioning, has been made part of the book.

My Vocation

By Richard E. Byrd, Edward A. Filene, William A. White, John W. Davis, Harry E. Fosdick, John Dewey, Charles H. Mayo, and 18 others. Compiled by Earl G. Lockhart. Cloth, 334 pages, 5¼ by 8, illustrated. Price, $2. Published by the H. W. Wilson Co., New York City.

Because of the way in which this book was written, it is very interesting, especially to the students of secondary-school age. Each of the 23 essays on vocations is preceded by a portrait and brief biographical note of the prominent man who contributed it.

1001 Ways to Use Concrete

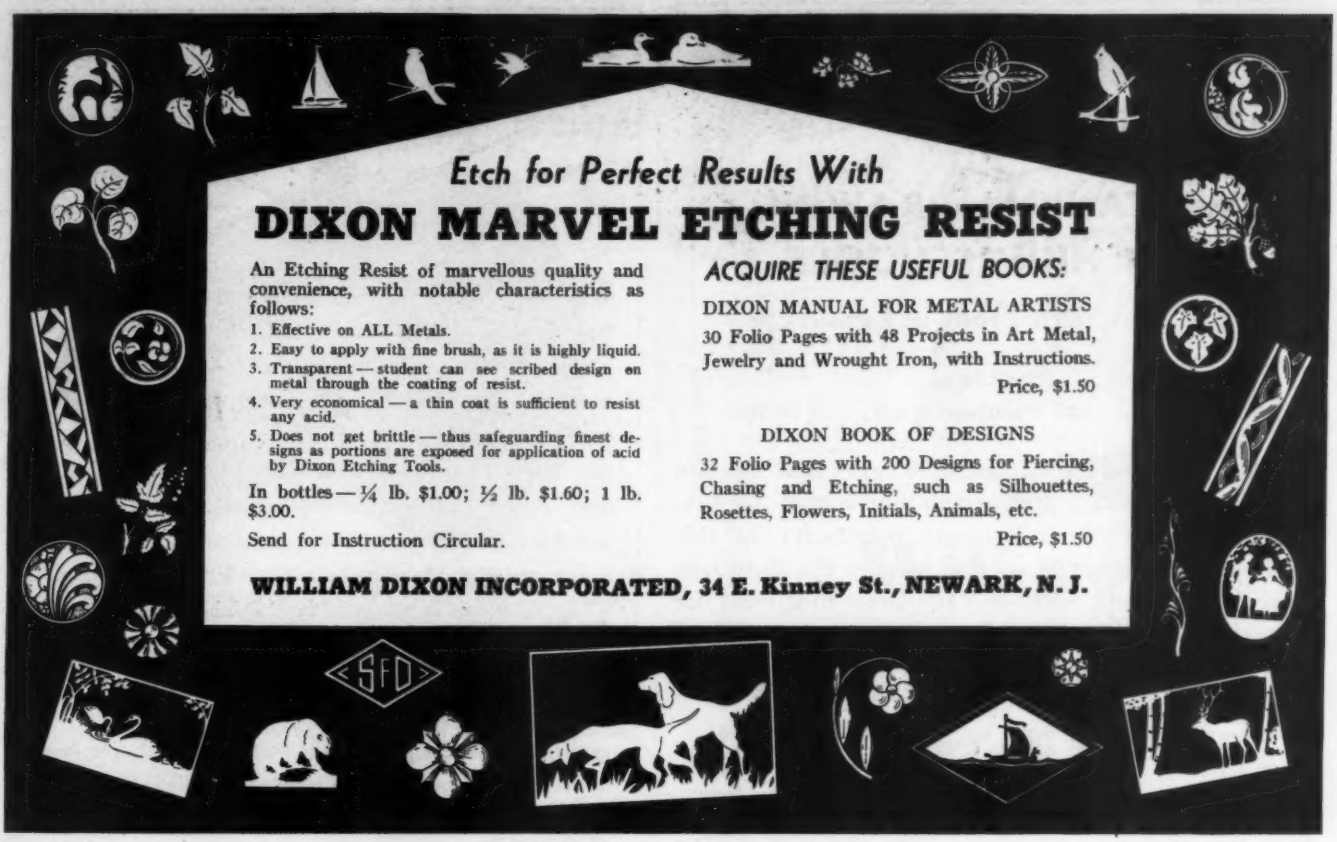
Edited by Harold O. Hayes. Cloth, 238 pages, 10 by 7, illustrated. Published by the Popular Mechanics Press, Chicago, Ill.

A story, interestingly told, about how cement and concrete are used in introducing the many objects made of concrete for the home; the garden; the farm; for domestic and public buildings; recreation; home, plant, and school shops; business and industry, and in art. The book contains much useful information, many kinks, and numerous fine projects.

American Wings

By Captain Burr Leyson. Cloth, 214 pages, 8½ by 5¾, illustrated. Price, $2. Published by E. P. Dutton & Co., Inc., New York City.

What boy is not thrilled when the subject of aviation is mentioned? Many dream of the time when they, as pilots, will make their debut as heroes of the air. The author of this book shows, however, that while the pilots may be heroes, their work is hard and prosaic. The glamor of the skies is shown to consist of close attention to many details, a heroic determination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to think of others first and of self last, and a willingness to work hard and to bring any kind of sacrifices that the service may demand.

The book is divided into 28 chapters in which all phases of aviation in the army, the navy, the air corps, the coast guard, commerce, mail, air transportation, and sport are fully covered.

Fashion Illustration

By Christine Schmuck, and Virginia Jewel. Cloth, 279 pages, 11 by 8, illustrated. Published by McGraw-Hill Book Co., New York City.

A very practical and comprehensive text on the subject of making fashion illustrations. All phases of the work are covered, beginning with a history of the art to the time when the artist is looking for a job, after having acquired the necessary skill by faithfully following the directions concisely but interestingly given by the authors.

Association News

The divisional association meetings of the Texas State Teachers Association were held during the past three weeks.

East Texas Division: The meeting was held at the State Teachers College, Nacogdoches, March 11 and 12, 1938. Mr. Colgate Elmer, Deputy State Supervisor of Industrial Arts, was chairman of the industrial-arts section. The program was a discussion of "The Place of Related Information in the General Metal Shop" by George W. Kibler, Associate Professor of Industrial Arts, East Texas State College, Commerce. The membership of the panel was Mr. Jack Covin, Gladewater, "Organization of Teaching Devices"; Mr. Chris H. Groneman, East Texas State College, Commerce, "Methods of the Laboratory of Industry," and George W. Kibler, "The Methods of the General Metal Shop."

North Texas Division: The meeting was held at North Texas State College, Denton, March 11 and 12, 1938. Mr. D. L. Manth was chairman of the industrial-arts section. The program consisted of the following: "Suggested Curriculum Changes in Industrial Arts," L. D. Keaton, East Texas State College, Commerce; "The General Shop Influence in Developing Citizenship," J. E. Cherry, Pashal High School, Fort Worth; "Organization of Shop; the Place of Foremanship, Training, and Other Factors Outside of Manipulative Skill and Technical Knowledge," P. W. Loucks, Technical High School, Dallas. The panel consisted of Mr. S. A. Blackburn, Northern Texas State Teachers College, Denton; Mr. Ray Hardaway, Technical High School, Dallas; Mr. M. C. Stone, Northern Texas Agricultural College, Arlington; Mr. H. O. Norris, T. L. Long, Jr., High School, Dallas; Mr. Albert Leland, Supervisor of Industrial Arts, Fort Worth, and Mr. C. C. Jones, Denton High School, Denton.

Northeast Texas Division: The meeting was held at the Tyler High School, Tyler, March 18 and 19, 1938. Mr. Berry Musgrave, Director of Industrial Arts, Texarkana, was chairman of the industrial-arts section. The program was as follows: "The Principal's Viewpoint in Carrying on the Industrial Arts Program," Mr. F. Ben Pierce, Texarkana; "Shop Arrangements and Teaching Devices," Mr. Chris H. Groneman, East Texas State College, Commerce; "A First Year of General Drawing for the High School," Mr. John F. Stanley, Director of Industrial Arts, Paris; "Possibilities for Vocational and Trade Training in the Senior High School and Junior College," Mr. Colgate Elmer, State Supervisor, Austin. Mr. J. G. Grove, East Texas State College, Commerce, led the panel discussion.

In the business section of the meeting, Mr. Merrel Bishop, industrial-arts teacher, Overton High School, Overton, was elected chairman for 1939.

The first Mu Sigma Pi meeting of the year was held at Mackenzie Union, on February 8, with President O. R. Dickerson in charge. Reports of the various committees were read and President O. R. Dickerson appointed a number of new committees.

The Western Pennsylvania Industrial Arts Conference was held at the California State Teacher's College, April 9, 1938. More than 460 teachers, supervisors, and superintendents were present.

Mr. W. E. Brunton, University of Pennsylvania, presided at the morning session. Mr. H. Frank Hare of the State Department gave a report of the Committee on Standards for High-School Graduation. Mr. Frank C. Moore, Cleveland, gave some of the trends of industrial-arts instruction.

Mr. L. H. Dennis, Secretary of the A.V.A., Washington, D. C., presided at the afternoon meeting. After an excellent musical program under the direction of Dr. Halsted, Dr. Paul Cressman brought greetings from the State Department and Senator Daniel A. Reed of New York State, well known as the co-author of the George-Reed bill for vocational education. Senator Reed stressed the need of well-prepared teachers for the proper training of youth today.

The meeting adjourned to meet again at Chambersburg, June 23 and 24, which is the state meeting of the Pennsylvania Vocational Association. — *George C. Donson.*

(Continued on page 14A)

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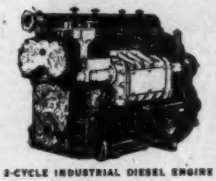

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(Continued from page 13A)

¶ The annual convention of the Illinois Vocational Association was held at Chicago, Ill., April 14, 15, and 16, 1938. The attendance far exceeded expectations. As was to be expected, the local committee on arrangements had worked hard, hence the convention proceeded smoothly and efficiently from start to finish.

The luncheons, dinners, and the annual banquet were attended by capacity crowds, as was also the Epsilon Pi Tau Fraternity luncheon on Saturday.

The general meeting on Friday was under the chairmanship of Dr. William H. Johnson, Superintendent of Schools, Chicago. The subject for discussion was Apprenticeship Training and Vocational Guidance. The speakers were Mr. Wilson Frankland, Vice-President, Steamfitters Protective Association, Chicago; and Dr. Homer J. Smith, Professor of Industrial Education, University of Minnesota, Minn.

Mr. Alexander M. Sullivan, Vocational Director, Chicago Public Schools, was chairman of the meeting held Saturday morning at which the relationships between general and vocational education, and the objectives of vocational training were discussed. Thomas J. Quigley, President, American Vocational Association; and Clarence Lineberger, Principal, Washburne Trade School, Chicago, were the speakers on this occasion. The discussion was led by Prof. Arthur B. Mays, Head of Department of Industrial Education, University of Illinois, Urbana.

At the Industrial Education meeting Saturday morning, presided over by O. A. Oakes, New Trier Township High School, Winnetka, Ill., Dr. William H. Johnson, Superintendent of Schools, Chicago, gave an address on the industrial arts in the Chicago City Schools. This was broadcast over WBBM. The discussion was led by Dr. William E. Warner, Prof. of Industrial Education, Ohio State University, Columbus, Ohio.

The many sectional meetings embraced trade and industrial part- and full-time education, personnel and guidance, auto mechanics and aviation, drafting, electromechanics, machine shop, printing, woodwork and general shop, trade and industrial education for women, and teacher training in vocational education.

At the Saturday luncheon meeting sponsored by the Epsilon Pi Tau Fraternity, H. H. Hagen, Principal, Crane Technical High School, Chicago, acted as toastmaster. On this occasion, Dr. William E. Warner, Prof. of Industrial Arts Education, Ohio State University, Columbus, spoke on the "Cultural Function of the Practical Arts" and Dr. Homer J. Smith, Prof. of Industrial Education, University of Minnesota, Minneapolis, on "Who Should Teach Vocational Education." Both of these speakers had previously given 15-minute broadcasts on their subjects.

J. Morgan Johnson, Moline, Ill., was elected president of the industrial division, and C. I. Carlson, Aurora, Ill., was elected treasurer of the same division.

The officers of the Illinois Vocational Association will be elected by the Board of Control in September. The present officers of the Association will continue until then.

¶ The 44th Annual Convention of the Western Arts Association held at Milwaukee, Wis., April 20–23, 1938, was most agreeably successful.

The general convention theme, "The Arts at Work in Education," was the core about which all of the proceedings of the entire convention were carefully worked out.

The first general meeting was held Wednesday afternoon under the chairmanship of Alfred G. Pelikan, Chairman Council, Western Arts Association, 1937–38.

The main speeches were given by Richard F. Bach, Director of Industrial Relations, Metropolitan Museum of Art, New York; and Frank Sohn, Designer, Vitrolite Division, Libbey-Owens-Ford Glass Company, Toledo, Ohio. Both of these speeches were based on the specific theme, "How Materials and Exhibits Contribute to Education in the Arts."

The second general meeting was held Thursday morning. Elizabeth Gilmartin, Chairman, Program Committee and Supervisor of Art, Public Schools, Toledo, Ohio, presided.

The specific theme of this meeting was "How Education in the Arts Contributes to General Education," and Dr. W. Carson Ryan, Jr., President, Progressive Education Association, and Director, Carnegie Foundation for the Advancement of Teaching, New York City; and John D. Hatch, Jr., Assistant Editor Parnassus, College Art Association, New York City, were the speakers.

The third general meeting was based on the theme, "How Education in the Arts Contributes to General Education." It was held Thursday evening and William H. Varnum, Vice-President, W.A.A., Chairman, Art Department, University of Wisconsin, Madison, Wis., presided. The speakers at this meeting were Arthur Lismer, Educational Supervisor, Art Gallery, Toronto, Ontario, Canada; and Dr. Frank E. Baker, President, Milwaukee State Teachers College, Milwaukee, Wis. The discussion was led by John R. Ludington, Assistant Professor, Department of

(Continued on page 16A)

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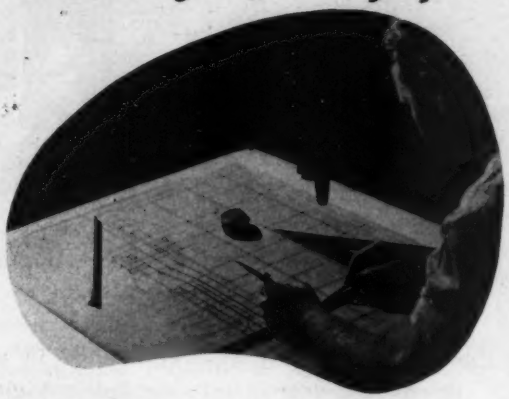

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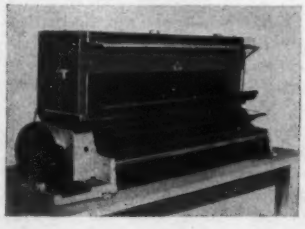

Ozalid "Type 1000" Combination Printer and Developer . . . a complete printing and developing unit having a speed of 32 linear inches per minute for all Ozalid materials up to and including 42 inches in width . . . a unit so clean and so compact that it can be placed on a table in a classroom . . . truly "a complete printroom in itself."

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Right now — at requisition time — is the time to plan on Dutch Kraft Kits for next year. You are assured better work at less cost. Used and indorsed by leading Vocational Shop instructors.

ADVANTAGES OF DUTCH KRAFT WOOD FINISHING KITS

Three sizes, containing from 20 to 40 materials, ranging in price from $2.50 to $8.15.

Same quantities and quality of materials cost you less because you buy at direct-from-the-factory prices.

Materials are of the same HIGH QUALITY used by leading furniture factories in Grand Rapids and throughout the country.

Complete, balanced assortments of all materials required for fine wood finishing.

FREE advisory service on wood finish problems to all users of Dutch Kraft Kits.

Send for this information NOW

Before you requisition, get complete information on these Kits. Full details, specifications, direct-from-the-factory prices sent on request, with the Dutch Kraft Manual on Wood Finishing, a helpful, practical guide for school shop use.

Dutch Kraft Corp.
Subsidiary of Grand Rapids Varnish Corporation
Main offices and factory:
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TRADE MARK — "THE SYMBOL OF QUALITY"

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Gentlemen:

Please send your Free Manual on Wood Finishing and specifications and prices of your Kraftsman Kits to:

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The wooden ships of old are gone to-day. Steel ships, more rugged and more enduring, have superseded them. Everything which must be strong, rigid, and sturdy, is made of steel today. And Manual Training Benches, which must stand up under abuse, are no exceptions. That is why Hamilton designed the new Steel Manual Training Bench. It is the strongest, most rigid, and enduring table made. Get full information on it before you buy benches.

This is only one design of the new Hamilton Steel Benches. You can get them in any drawer arrangement desired. All steel benches have welded steel frames, finished in olive green. The drawer units are finished in natural birch... as is the heavy 2¼" thick edge-grain maple working top. For manual training departments, this super-strong, steel construction is ideal... it means long life.

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Send me more information on Steel Manual Training Benches.
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Address_____
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HAMILTON MFG. CO.
TWO RIVERS, WISCONSIN

(Continued from page 14A)

Industrial Arts, Ball State Teachers College, Muncie, Ind.

The fourth general session presided over by Elizabeth Wells Robertson, Director of Art, Public Schools, Chicago, Ill., was held Friday morning. Its theme was "How the Arts Relate to Each Other," and the speakers were Ruth Reeves, American textile designer, who is assisting in assembling the Index of American Design, WPA, Federal Arts Project, New York; and Frank Lloyd Wright, Architect, Taliesin, Spring Green, Wis.

The fifth general session was devoted to the theme "The Community Contributes to Art Education." Frank C. Moore, Director, Industrial Arts Department, Public Schools, Cleveland, Ohio, presided. The speaker for this meeting was Prof. Laszlo Moholy-Nagy, Director, The New Bauhaus, Chicago, Ill.

There were, of course, many sectional meetings which were well attended by the teachers of art, home economics, and industrial arts.

The industrial-arts group had a meeting Thursday afternoon at which Clyde A. Bowman, Dean, Division of Industrial Education, Stout Institute, Menomonie, Wis., presided. The program was built around the idea, "The Teacher and Industrial Arts Education," and the speakers were Dr. Lawrence F. Ashley, Head, Department of Industrial Arts, Eastern Illinois State Teachers College, Charleston, Ill; and Dr. Samuel Everett, Associate Prof. of Education, Northwestern University, Evanston, Ill.

The industrial-arts meeting on Friday afternoon was presided over by Orville Sink, Head, Department of Industrial Arts, Ball State Teachers College, Muncie, Ind. The theme for this section was "The Interdependence of the Arts in Education," and the speakers were Letitia Walsh, Practical Arts Education, School of Home Economics, The Stout Institute, Menomonie, Wis.; Arthur G. Brown, Practical Arts Education, School of Industrial Arts, The Stout Institute, Menomonie Wis.; and Elizabeth Wells Robertson, Director of Art, Public Schools, Chicago, Ill.

The ship awarded its prizes Saturday morning. At the business meeting, Elizabeth Gilmartin of Toledo, Ohio, was elected president; Ray Woolman of Des Moines, Iowa, vice-president; Jennie Robertson of Wichita Falls, Tex., auditor; and Grace M. Baker of Greeley, Col., and B. N. Hastings of Nashville, Tenn., council members.

¶ The First Annual Convention of the Texas Vocational Association, with its theme "Future Trends in Vocational Education," was held March 24–26, 1938, at the Baker Hotel, Dallas, Tex. The address of welcome was made by Dr. Norman R. Crozier, Superintendent of Dallas Public Schools, and Mr. R. H. Brister, Waco, Tex., president of the Texas State Teachers Association, extended greetings.

Dr. L. A. Woods, Superintendent of Public Education, Austin, spoke on "Vocational Education in Texas," and Dr. Bradford Knapp, President, Texas Technological College, Lubbock, spoke on "Future Trends in Vocational Education."

¶ The Annual Spring Meeting of the Minnetonka Industrial Arts Club was held on the campus of the University of Minnesota Farm School on Saturday, April 23, 1938.

Mr. J. H. Hansman, St. Paul Vocational School, gave a demonstration of "Casting Small Articles in Aluminum, Brass and Copper." The Minnesota Linseed Oil Company presented a demonstration of "How to Apply Paint and Finishes." Dr. Homer J. Smith, University of Minnesota, gave a talk on "The Industrial Arts Teachers' Office." Mr. Stan Pawelek, Winona State Teachers College spoke on "The Industrial Arts Teacher's Project Complex." Mr. H. T. Thompson, High School, Staples, Minn., gave a talk on "Our State Exhibits." — *George L. Simnicht.*

¶ The Pennsylvania Vocational Association will hold a meeting at Chambersburg, Pa., June 23–25.

¶ The National Graphic Arts Education Guild will hold its 17th Annual Printing Conference at Washington, D. C., from June 30 to July 3.

¶ President W. A. Brandenburg announced on Monday that he has issued a formal invitation to supervisors and teachers to hold a regional conference on current problems of industrial arts, to meet at Kansas State Teachers College, Pittsburg, Kans., on Friday and Saturday, October 7 and 8, 1938. Invitations will be sent to the state departments of public instruction, to departments of industrial education in all public and private universities, colleges, and to all city supervisors and teachers of industrial arts, in the four adjoining states of Kansas, Missouri, Oklahoma, and Arkansas.

A General Program Committee has been organized, consisting of the following city supervisors and members of the college faculty: O. B. Badger, Tulsa, Okla.; L. E. Falgren, Kansas City, Kans.; C. B. Gatchell, Joplin, Mo.; R. B. McHenry, Fort Smith, Ark.; V. L. Pickens, Kansas City, Mo.; J. C. Woodin, Wichita, Kans.; O. A. Hankammer, R. L. Schwanzle, W. T. Bawden, Kansas State Teachers College, Pittsburg, Kans. Dr. Bawden is chairman of the committee.

The three members of Kansas State Teachers College faculty have been designated an Execu-

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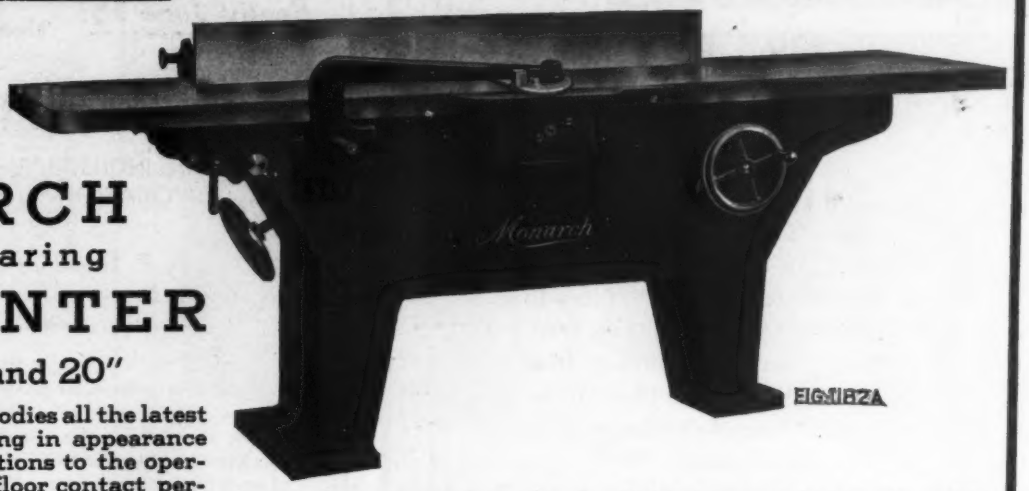
MONARCH
Ball Bearing
JOINTER
12", 16", and 20"



This new machine embodies all the latest improvements. Pleasing in appearance and free from obstructions to the operator, the three point floor contact permits easy installation and prevents distortion and rocking.

Safe, accurate and rugged, it will take care of all operations, including surfacing, squaring, beveling, and rabbeting. Concave or convex surfaces for spring glue joints can be made.

Special aluminum safety guard, giving absolute protection in all positions.

Finest precision type ball bearings, 3 or 5 H. P. shaftless, dust-proof or ventilated motor mounted direct on cutter-head, or belt drive, as desired.

Latest improved four-knife safety cutterhead — high speed steel knives. Accurate knife adjustment made easy.

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AMERICAN SAW MILL MACHINERY CO., 74 Main St. Hackettstown, N. J.

tive Committee on arrangements, and will be responsible for local details and publicity. Preliminary plans for the conference were discussed at a meeting of the General Committee held at Kansas State Teachers College on Saturday, March 26.

¶ Having "The South's Challenge to the Arts" as its theme, the seventh annual convention of the Southeastern Arts Association was held in Tampa, Fla., on March 10–12, 1938. Approximately 350 industrial- and fine-arts teachers were in attendance.

At the first industrial-arts section meeting held at the University of Tampa, Mr. J. I. Sowers, Director of Industrial Arts for Miami Public Schools, and Dr. William T. Bawden, Head of Industrial Education Department, Kansas State Teachers College, Pittsburg, Kans., were the principal speakers. Dr. H. H. London, Professor of Industrial Education, Mississippi State College, presided. The theme of the address by Mr. Sowers was "Methods of Instruction in the Industrial Arts Shop," while Dr. Bawden spoke on "National and Regional Trends in Industrial Education."

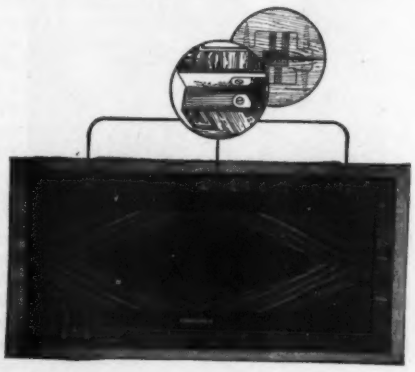
A second industrial-arts section meeting was presided over by Mr. C. Phil Peters, Principal of Henry B. Plant High School of Tampa. Mr. W. H. Coppedge, Assistant Professor of Industrial Education, Alabama Polytechnic Institute, Auburn, Ala., addressed the group on "Industrial Arts for Elementary Schools." This address was followed with another by Dr. H. H. London, who spoke on "The General Shop for Southern Schools." The panel discussion, "Some Problems of the Teacher of Shop Work and Drafting," was led by Dr. Bawden, and contributions were made by Mr. Kenneth Bing, Statesboro, Ga.; Mr. J. Knapp Boddiford, Thomasville, Ga.; Mr. L. B. Knox, Tampa, Fla.; Mr. C. Q. Payne, Orlando, Fla.; Mr. Earl K. Rogers, Atlanta, Ga.; Mr. B. N. Hastings, Nashville, Tenn., and Mr. Wm. E. Roberts, Dunedin, Fla.

At a general session of the convention on Saturday morning, an address on "Relation of Fine and Industrial Arts" was made by Dr. Bawden. Mr. C. A. Conley, Director of Vocational Education, Tampa, gave an address on "Art Consciousness in the Future Craftsmen of the South."

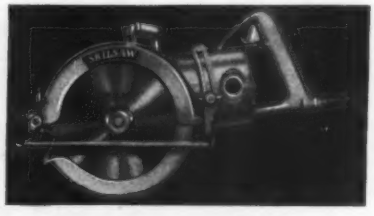
The Association voted to hold its 1939 convention in Birmingham, Ala.—*I. E. Harrison.*

New Products

¶ The Soss Mfg. Company, Inc., Roselle, N. J., has perfected and placed on the market a new invisible hinge, which already has attained great popularity. The Soss improved, invisible hinge is a simple, but strong device. It consists of a series of especially treated plates and pins, operating in a track which is of rigid, nonsagging, and firm truss construction. With the use of this hinge, a single door, or a battery of folding partitions, can be opened or closed as though working on ball bearings, with no sagging or marring. The Soss hinge comes in a variety of sizes from doors on furniture to heavy interior doors, and multi-doors like folding partitions.



¶ Greater power, faster cutting speed, better balance and new safety features characterize the new Skilsaw Model "87" recently announced by Skilsaw Inc., Chicago, Ill. It has a 9-in. blade and cuts to a depth of 2⅞ in. It will cross cut 3-in. dressed lumber and bevel cut lumber 2⅜ in. thick at 45 deg. It has been specially designed to permit unusually quick adjustment for both depth and bevel cutting. The blade has a free speed of 3600 r.p.m. as standard, with an optional speed of 5000 r.p.m. It is protected by an automatic spring-operated telescopic guard that rotates on ball bearings.



Skilsaw Model "87" is only 19 in. long and its frame and handle are designed for perfect balance so that it may be operated with the least strain on the hand of the user. The frame is of special die-cast aluminum alloy. All shafts are mounted

(Continued on page 18A)

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IN INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

By F. Theodore Struck, Ph.D.
Head of Department of Industrial Education
Pennsylvania State College

This book is designed for prospective teachers, teachers in service, and for students of education. It is the result of many years of teaching, supervisory and administrative experience, and teacher training. Dr. J. C. Wright, Assistant United States Commissioner of Education, says of it: "The book has balance, is comprehensive and authoritative. It should serve as a source of inspiration to teachers and be a means of furthering purposeful and creative learning in the practical arts and in vocational education."

Approximately 666 pages 6 by 9 Probable price, $3.50

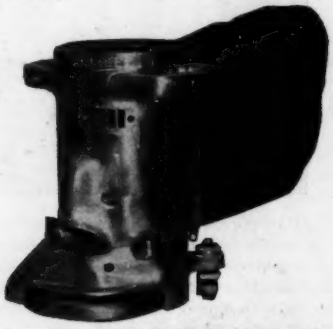
JOHN WILEY & SONS, INC.
440 Fourth Avenue New York, N. Y.

(Continued from page 17A)

on ball bearings. A blower arrangement, built into the upper guard, keeps the line of cut free of sawdust. It may be used for cutting wood, metal, stone, tile, and compositions.

¶ Resurfacing stair treads has always been a tedious, slow task when done with a hand scraper. It can now be accomplished with this new lightweight, dustless, 6-in. disk sander, manufactured by the Porter-Cable Machine Co., Syracuse, N. Y.

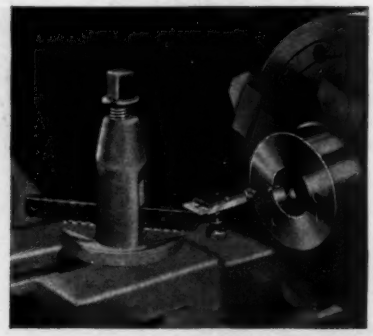
The operating handles are high enough to clear the nosing of the tread above, thus preventing interference but allowing the disk to sand right up to the riser and stringers. Traveling at tremendous speed, gear driven by a ¾-h.p. Universal motor, the disk sands out its own scratches and leaves a smooth, even surface that matches landings and floor areas done with a drum sander.



Then, too, this machine is excellent for surfacing the edges of floors, or other surfaces which cannot be done by larger sanders. It weighs 20 lbs. and is extremely easy to use. A powerful vacuum dust-collecting system picks up all of the dust, assuring a clean, sanitary job.

An electric light is encased in the front of the frame to illuminate the surface around the cutting arc of the disk. Abrasive disks of any commercial grit may be used on this edger. They are 6 in. in diameter with a ¾-in. center hole. A complete disk-cutting outfit is included with each machine as standard equipment.

¶ The "Universal Junior" Indicator No. 564, just placed on the market by the L. S. Starrett Company, Athol, Mass., has unusual versatility and combines low cost with adaptability to a broad range of applications. In the "Universal" indicator, the ball contact, for example, is



frictionally held and may be set to touch the work at any desired angle. The sleeve holding the contact point can be turned completely around and the entire indicator can be swung through a full circle when mounted on the shank. The device makes it possible to keep the graduated scale in the most comfortable and convenient position for easy reading, while physical strain and eyestrain are eliminated.

The indicator can be mounted on the side of one end of the shank or on the top of the other when used in the tool post of a lathe. Readings are made in thousandths over a range of .012 by means of a needle and graduated scale. All parts are case-hardened steel or die-cast.

Complete information will be sent to any shop instructor upon request.

¶ The American Saw Mill Machinery Co., Hackettstown, N. J., have announced the development of a new, complete line of economy edgers, incorporating their "Tru-Feed" edger drive. This unique positive edger drive will accurately feed boards at any desired speed. The double pulley countershaft and the idler are each mounted on a swinging arm, which permits the pulleys to ride on the belts, thus keeping the belts in proper tension at all times.

Ball-bearing table rolls on all edgers. Left-hand edgers are standard, but right-hand machines will be furnished without extra charge if specified when the order is placed. The edgers are furnished to handle 28-, 33-, or 46-in. stock.

¶ Painting on glass with electricity is a new technique in the realm of applications developed by the Chicago Wheel & Mfg. Co., Chicago, Ill. In the hands of professional artists who use the Handee for drawing, sketching, and actually painting on glass, it is found that the results are nearly identical with those obtained by using brushes.

This technique is not confined to the Handee alone. A flexible shaft also could be used for "painting on glass with electricity."

(Continued on page 21A)

ADVERTISING PAGES REMOVED

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(Continued from page 18A)

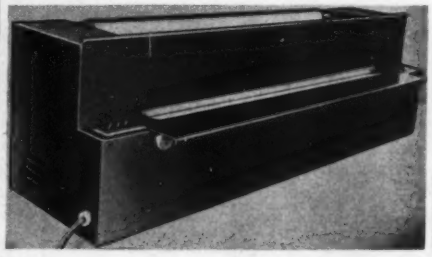
¶ "Modern School Shops" is the new booklet published by the South Bend Lathe Works, South Bend, Ind. It is available free of charge to those interested in vocational education.

The new 32-page book is composed entirely of illustrations showing interesting school machine-shop installations, and indicating the kinds and

sizes of machinery that are most practical in different sizes of schools where students are taught modern machine-shop practice.

¶ The new Model 4 Printer announced by Charles Bruning Co., Inc., Chicago, Ill., incorporates important mechanical and electrical improvements. It is designed for making blueprints or black and white prints.

The new machine is of the continuous type, the tracings and paper being carried on a heavy, endless canvas band past a curved contact glass, inside of which are mounted two new styles, long-life Cooper-Hewitt mercury vapor tubes, providing the illumination for exposing the print.



Because no resistance is used in the power circuit, these tubes consume 100 watts less current per tube than on the previous model. Greater light output is also gained, since each tube produces 19.5 lumens per watt compared to 14 lumens for the older type. In addition, the type of light produced by this new tube is much more efficient for printing, producing a printing speed approximately 50 per cent greater than in the previous model. A positive control of band speed permits a speed regulation varying from 2 to 30 in.

Ball-bearing construction is used throughout the machine, both for motor and rolls.

The Model 4 BW printer is designed for prints up to and including 42 in. in width, and any length. The over-all size of the machine is 20 by 19 by 61 in. It is wired for 110 volts a.c. or d.c., and may be plugged into any light circuit.

¶ The Cincinnati Milling Machine Company, Cincinnati, Ohio, will be glad to furnish to teachers, free of charge, a pamphlet on "Milling Machine Practice." This material is reprinted from *Kent's Mechanical Engineers' Handbook* for which it was furnished by the Cincinnati Milling Machine Company.

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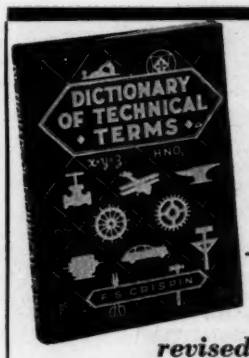

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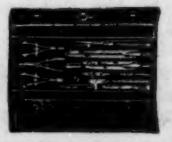

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